

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA  
AT CHARLESTON

OHIO VALLEY ENVIRONMENTAL  
COALITION, INC., WEST VIRGINIA  
HIGHLANDS CONSERVANCY, INC., and  
SIERRA CLUB,

Plaintiffs,

v.

CIVIL ACTION NO. 2:13-5006

FOLA COAL COMPANY, LLC,

Defendant.

Huntington, West Virginia  
August 22, 2014

TRANSCRIPT OF BENCH TRIAL - DAY 4  
BEFORE THE HONORABLE ROBERT C. CHAMBERS  
UNITED STATES DISTRICT JUDGE

APPEARANCES:

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Menzie - Cross

Friday, August 22, 2014, at 9:10 a.m. in open court

THE COURT: All right. Are we ready to resume with the cross-examination of Dr. Menzie?

MR. LOVETT: Plaintiffs are ready, Your Honor.

THE COURT: All right. Dr. Menzie, if you'll return to the stand.

BY MR. LOVETT:

Q. Good morning.

A. Good morning.

Q. I hope it's not a two-bottle day. We can get through this with just one of those.

A. Which one?

Q. I hope one of those is sufficient for the length of the examination, your water bottles. Nevermind.

A. Well, there's a couple of half bottles from yesterday.

Q. Okay. Well, in any event, good morning.

So yesterday we left off talking -- I was asking you for some data to help understand how you had performed the calculations you performed. Do you remember that?

A. Yes.

Q. Okay. So did you bring some data with you today?

A. You were asking me for numbers of samples and things like that. So I have that.

Q. Okay. Well, why don't you tell me what you have.

A. I think the first question was related to the reference

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1 stations used to develop the WVSCI.

2 Q. Yes.

3 A. And I determined that there were, I guess, 57 such  
4 stations, 95 percent of which were level 1 reference stations.

5 Q. To determine the WVSCI?

6 A. Yes.

7 Q. How did you determine that?

8 A. In the WVSCI development document and also by looking at  
9 the database.

10 Q. Okay. Which database?

11 A. The West Virginia database.

12 Q. Okay. And how did you determine from looking at the  
13 West Virginia database that there were reference -- level 1  
14 reference were used?

15 A. They are labeled as such. And I also ran a screening  
16 test against the criteria that Tetra Tech established --

17 Q. Uh-huh.

18 A. -- for selecting stations for doing the WVSCI, and they  
19 laid out the criteria. I ran through that criteria using the  
20 West Virginia database, and I arrived at these same 57  
21 stations, 95 percent of which are all level 1 stations.

22 Q. Okay. I was asking you for data, though, I think about  
23 your research as well.

24 A. Yes.

25 Q. Did you get some numbers for that?

## Menzie - Cross

1 A. Oh, you had asked me -- so the highest temperature of  
2 those stations was 20 degrees Centigrade. So that gives you a  
3 bound on the development station.

4 Q. The highest level of the stations used to develop the  
5 WVSCI was 20 degrees C, right?

6 A. Right.

7 Q. Okay. So that's considered -- that's level 1 reference.  
8 Is that fair?

9 A. That is the temperature of that set of data, the highest  
10 dataset, but the lowest is obviously lower than that.

11 Q. Obviously. But the highest is 20.

12 A. 20 is the highest.

13 Q. Okay. Thank you.

14 A. Then you asked me about the number of records or stations  
15 or measurements that were in the habitat comparisons.

16 Q. Uh-huh.

17 A. And I can read these off or you can look at it, but if  
18 you remember, there were three panels.

19 Q. Which exhibit is it? Do you remember? Help me find it  
20 here. Before you, you have the book of exhibits. I placed it  
21 there. And your exhibits are in the 70's of the tabs.

22 A. Okay. Got them.

23 Q. Are you talking about tab 73 or something different?

24 A. Let's see if we have it here. No, it's more like -- it  
25 would be at tab -- it would be on page JE 959.

Menzie - Cross

1 Q. So that's tab JE 75, page JE 595.

2 A. Correct.

3 Q. Okay. Great. So what did you determine for that?

4 A. Okay. So if you go from left to right --

5 Q. Uh-huh.

6 A. -- the first panel has all the records.

7 Q. Right.

8 A. And there are 1,707 records.

9 Q. Okay.

10 A. For the data that are labeled -- let me see if I've got  
11 this right here. For the data that are labeled greater than  
12 300 to 2000 microsiemens --

13 Q. Yes.

14 A. -- for the optimal stations, there are a hundred records  
15 in that bar for the --

16 Q. So that's the 300 to 2000?

17 A. Right. So there are a hundred optimal stations.

18 Q. All right.

19 A. The next one over is the --

20 Q. Do you mind if I ask you, how many suboptimal stations  
21 were there?

22 A. Well, none.

23 Q. You didn't use the suboptimal stations. Okay.

24 A. Right.

25 Q. As we discussed.

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1 A. So the next one over, which is marginal/poor, greater  
2 than 300, there are 346 measurements represented in that bar.

3 Q. Okay.

4 A. For the next one over, which is less than 300 and  
5 optimal, there are 724 records represented in that bar. And  
6 then for the next one, the last one in this panel, which is  
7 less than 300 but marginal or poor, there are 489 records  
8 represented in that bar.

9 Q. I'm afraid I missed that. The 346, I thought that was  
10 the total in the panel. That's not right.

11 A. No, the total -- the entirety of the dataset is 1,707  
12 records.

13 Q. That's true of the less than 10 inch, as well as all  
14 records?

15 A. No. No. No.

16 Q. 10 feet. 10 meters I mean.

17 A. I'm going panel by panel. I just gave you the first  
18 panel.

19 Q. Okay. I'm sorry. So 346 in the less than 300  
20 microsiemens in the first panel?

21 A. For the -- okay. Starting again, so for the second green  
22 bar in the first panel --

23 Q. Uh-huh.

24 A. -- there's a hundred records.

25 Q. Got that one.

Menzie - Cross

1 A. For the second blue bar, there's 346.

2 Q. Okay.

3 A. For the next green bar, there's 724.

4 Q. Okay.

5 A. And for the next blue bar, there's 489.

6 Q. And those are optimals?

7 A. The last one is -- well, the blue bar would be -- the 489  
8 would be less than 300 but marginal and poor.

9 Q. Marginal and poor?

10 A. Right.

11 Q. You didn't -- okay. Right. I see. Okay. Got it.

12 A. If you go to the middle panel --

13 Q. Uh-huh.

14 A. -- there's a total of 1,365 records that we used in the  
15 analysis.

16 Q. Okay.

17 A. I'm going to -- so then if we go to the second green  
18 bar --

19 Q. Uh-huh.

20 A. -- which is optimal but greater than 300 --

21 Q. Yes.

22 A. -- there's 54 records represented in that dataset.

23 Q. Okay.

24 A. If we go to the next blue bar --

25 Q. Uh-huh.



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1 A. -- there's 315. If we go to the next green bar, which is  
2 optimal, there's 530.

3 Q. Okay.

4 A. And if we go to the next blue bar, which is marginal but  
5 less than 300 --

6 Q. Uh-huh.

7 A. -- there's 449 records.

8 Q. And, again, you don't know how many suboptimal.

9 A. There are no suboptimals in here.

10 Q. Right. You don't know how many there were in the  
11 database, though, for those measures.

12 A. No. I mean I could look, but we weren't talking about  
13 that.

14 Q. Okay.

15 THE COURT: Wouldn't that just be a mathematical  
16 calculation by subtracting all these bars you just numbered?

17 THE WITNESS: No, because the totals I gave you were  
18 for that dataset.

19 THE COURT: I understand.

20 THE WITNESS: There's no suboptimals. And then I  
21 presume you have the Bernhardt data.

22 BY MR. LOVETT:

23 Q. Yes. Did you look at that as well?

24 A. We have the numbers as -- I think we are using a total of  
25 57 of the Bernhardt data records. There are four. If you go

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1 over to the second green bar --

2 Q. Uh-huh. The second green bar is --

3 A. Is --

4 THE REPORTER: Wait a minute. Wait a minute.

5 MR. LOVETT: I'm sorry.

6 THE WITNESS: The second green bar is optimal,  
7 greater than 300.

8 BY MR. LOVETT:

9 Q. Yeah.

10 A. There are four samples there. The blue bar after it is  
11 11. The next green bar is 25. And then the next blue bar is  
12 17.

13 Q. What about the first two bars?

14 A. They're the total records. So these are all the optimals  
15 and all the -- so they would add up -- I don't have them  
16 broken out in front of me, but they -- the green bar, the  
17 first green bar is the sum of all the optimals, and the first  
18 blue bar is the sum of all the, you know, the marginals.

19 Q. Okay. So we came up with, in that dataset, 58 total  
20 optimal, 28 total poor or marginal, and 137 suboptimal.

21 Does that seem right to you?

22 A. Can you say that again? I wasn't following what you were  
23 saying.

24 Q. Yes. In the Bernhardt dataset, the total numbers are 58  
25 optimal, 137 suboptimal, 28 poor/marginal.

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1 A. That would be -- yes. I think there's a difference on  
2 how we do optimal. Our optimal is as defined by West Virginia  
3 DEP. I think you're using a different number.

4 Q. Okay. It does look like our poor are the same.

5 A. Yeah, that's correct.

6 Q. That's 28, right?

7 A. Yeah. But you have some suboptimal ones placed in your  
8 optimal category.

9 Q. And why would that be? How would it be? Explain the  
10 database to me. Why would someone look at the database and be  
11 confused about whether something was optimal or suboptimal?

12 A. I think --

13 MR. MCLUSKY: Your Honor, he's asking how the  
14 plaintiffs would have come up with a different scoring  
15 mechanism. We're going to be here all day. This is a  
16 deposition right now at this point.

17 MR. LOVETT: Well, it is sort of a deposition.  
18 That's because I've never had these data before.

19 THE COURT: Overruled.

20 THE WITNESS: I think the circumstance is that, as  
21 far as I can tell, your optimal includes values that are  
22 greater than 150 --

23 MR. LOVETT: Uh-huh.

24 THE WITNESS: -- while the state uses and has in  
25 their database greater than 160.

Menzie - Cross

1 BY MR. LOVETT:

2 Q. Okay.

3 A. And so you've lumped some suboptimals into your optimals.

4 Q. So you've even got fewer data points than we would have  
5 had for the optimal.

6 A. Right. There are four optimal, according to the state.

7 Q. And the suboptimal category that you excluded is even  
8 bigger than 837, right?

9 A. Say that again, please.

10 Q. Well, the suboptimal, we have 137 suboptimal.

11 A. Okay.

12 Q. So that number would be actually larger the way you ran  
13 your calculations, right?

14 A. Right.

15 Q. Okay. All right. What other data did you bring with  
16 you?

17 THE COURT: Before you get off of that, Dr. Menzie,  
18 when you were using -- preparing this chart, looking at the  
19 Bernhardt data, as I understand, you said you used 57 samples  
20 that came from the Bernhardt data.

21 THE WITNESS: Right.

22 THE COURT: Why did you pick just 57, and how did  
23 you pick them?

24 THE WITNESS: Okay. So we picked all the samples  
25 that were designated by West Virginia DEP as either being

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1 optimal or marginal.

2 THE COURT: Okay. All right.

3 THE WITNESS: And why there's a little bit of a  
4 difference is that the plaintiffs' experts have lumped  
5 suboptimal into optimal.

6 BY MR. LOVETT:

7 Q. Okay. What else did you bring?

8 A. There was a question on figure 1, how many samples were  
9 in these different categories.

10 Q. Figure 1 is tab 69, I think; is that right?

11 A. Yes.

12 Q. So that's Joint Exhibit 69, page JE 953.

13 A. Right.

14 Q. Okay. What did you bring to supplement?

15 A. Okay. So these are all headwater streams as defined by  
16 less than 10 square miles.

17 Q. Right.

18 A. The reference level 1 samples are 153 reference level 1  
19 samples. There are 177 low conductivity samples, which means  
20 less than 50 microsiemens, the lowest conductivity range. And  
21 there are 516 samples that exceed 300 microsiemens per  
22 centimeter.

23 Q. Okay. And that is filtered, as I think you said, for  
24 less than 10 square miles, right?

25 A. Right.

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1 Q. So am I right, did you filter the temperature data for  
2 less than 10 square miles but the RBP data for less than  
3 10 meters?

4 A. Correct.

5 Q. Why did you do it that way? What's the logic between not  
6 comparing them the same way?

7 A. Well, I was thinking that, as I looked at it, I wanted to  
8 think about habitat kind of on the scale of a system that was  
9 smaller in width, so more relevant to Stillhouse.

10 Q. Uh-huh.

11 A. So that's basically the reason behind it.

12 Q. Well, why didn't you pick the same thing, then, for  
13 temperature?

14 A. Because I thought temperature was a parameter that was  
15 operative separate from habitat, and I was looking for, you  
16 know, thermal preferences.

17 Q. Okay.

18 A. But for animals that inhabited the headwaters.

19 There's a last request.

20 Q. Yes.

21 A. You had asked about the temperature for -- measurements  
22 for Stillhouse, the dataset for that.

23 Q. Yes.

24 A. So that monitoring has been -- the monitoring dataset  
25 that we utilized includes 2008 to 2013.

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1 Q. It does? It includes all those?

2 A. Yes.

3 Q. But you only used 2011 and '12, right?

4 A. No, 2008-2013. We had two datasets. So I went back and  
5 checked on what we used for our calculation, and we have data  
6 for two times per month.

7 Q. So what tab was that relating to? Do you remember?

8 A. It's figure 9, I think.

9 Q. Okay. So that is --

10 THE COURT: 961.

11 MR. LOVETT: Thank you.

12 BY MR. LOVETT:

13 Q. So it's your testimony that the boxes, the blue boxes  
14 here that say Stillhouse Data, that that is the median; is  
15 that right?

16 A. Well, those are box and whisker plots that include the  
17 median within them.

18 Q. Okay. So those are the total number, then, of samples  
19 between -- I just want to make sure I've got this -- between  
20 two thousand -- did you tell me eight and thirteen?

21 A. Right. I haven't done this particular calculation, but  
22 if you wanted to estimate the number of sampling points that  
23 are in any one of those blue bars --

24 Q. Yes.

25 A. -- you could multiply by the number of years of data

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1 times two and you get a rough estimate.

2 Q. I understand. But it's your testimony that you used all  
3 of the data from years 2008 to 2013 to create the blue bars on  
4 figure 9.

5 A. That's correct.

6 Q. You did not use only 2011 and 2012 data to do that.

7 A. That's right.

8 Q. And did you perform that yourself?

9 A. I had an assistant do that calculation.

10 Q. Okay. On the other hand, the data from the other bars  
11 there come from the West Virginia database, right?

12 A. Correct.

13 Q. And what years of data from the West Virginia database  
14 did you use to compare them to?

15 A. We used the record as it existed. I want to say that  
16 it's -- I'd have to go back and check the years.

17 Q. Uh-huh.

18 A. But it's probably somewhere in the neighborhood of maybe  
19 1997 or so, up through maybe 2010.

20 Q. Is it 2007 or is it 2010?

21 A. I think it's probably 2010, but I'd have to go back and  
22 check.

23 Q. Okay. That's not -- is there any way we could have  
24 figured that out from your report and the information that you  
25 gave us before your deposition?



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1 A. No. I would've figured this would've been a discussion  
2 we would have had at deposition.

3 Q. Uh-huh. Are you fairly confident it's 2010?

4 A. I can check, but --

5 Q. Can you check really quickly?

6 A. While I'm sitting here?

7 Q. No. I mean like if we take a two-minute break at the end  
8 of this, can you come back and tell me the answer to that?

9 A. I can consult with various folks and stuff.

10 Q. Yeah. Okay. All right. And those are all the data I  
11 asked you for, right?

12 A. Correct.

13 Q. Okay. Now, when you --

14 A. Would you like me to check on that now or --

15 Q. No. I don't think we need to interrupt this. I think  
16 there will be a break at some point before you're finished.

17 A. Okay.

18 Q. You could even tell your lawyer on his redirect. I don't  
19 care. I just want to know the number -- or the date.

20 Now, you used how many total sites to do your temperature  
21 assessments?

22 A. It's close to the number of samples. So the numbers I've  
23 given you is sort of a rough proxy for the number of sites.

24 Q. Did you -- so to derive that, you used all the samples  
25 you had from the database.

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1 A. Right, that met our criteria.

2 Q. Okay. And then we were talking about the temperatures I  
3 think when we left off, the temperatures from level 1, 2, and  
4 3 reference sites. Do you remember that?

5 A. Right.

6 Q. And did you go do any work to figure out what the mean or  
7 median temperature was at those reference sites?

8 A. Well, again, you know, kind of thinking about the median,  
9 I did run an exercise of adding in the headwater streams that  
10 were level 2 --

11 Q. Uh-huh.

12 A. -- and basically looks the same as what you have in front  
13 of you.

14 Q. What I have in front of me?

15 A. Basically figure 9.

16 Q. Okay. Figure 9? Does it make -- the maximum summer  
17 temperature at level 2, did you look at that and determine  
18 what it was?

19 A. The maximum summer temperature for headwaters in level 2,  
20 I can -- again, if we want that specific number, we can --

21 Q. 23.4 sound right?

22 A. I don't know. I'll have to --

23 Q. All right. You didn't do that. You didn't do that.

24 A. Well, I have that information, but basically the median  
25 is very similar and --

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1 Q. Okay.

2 A. I also checked -- tried to check on this other question  
3 you asked me about for where do these high temperatures come  
4 from that the state uses.

5 MR. LOVETT: May I approach, Your Honor?

6 THE COURT: You may.

7 BY MR. LOVETT:

8 Q. I'm showing you a document that was provided to us after  
9 your deposition, I believe, which is entitled "A cautionary  
10 note." Is that a paper written by you?

11 A. Yes.

12 Q. Okay. And what was the purpose of this paper?

13 A. Basically to identify some of the issues associated with  
14 the derivation of the benchmark.

15 Q. Okay. So this is similar to your expert report, right?

16 A. Yes, similar but a little bit different.

17 Q. It's more detailed, though, in many ways, isn't it?

18 A. In some ways, and it probably has a little bit more  
19 information in it.

20 Q. All right. Let's turn to page 9 of that. And this is  
21 what I don't understand. You say at the bottom of page 9,  
22 there were 419 samples at 408 locations that met the criteria  
23 for watershed size, summer months, and the measurement of  
24 temperature data.

25 Why were there only -- I thought you just -- maybe I

Menzie - Cross

1 misunderstood, but I thought you just told me you used the  
2 whole database for this.

3 A. We used headwater streams for this.

4 Q. You used -- and a headwater stream is defined as less  
5 than 10 square miles?

6 A. Yes.

7 Q. All right. So there were only 419 streams that actually  
8 were in the data -- that were actually -- that you used for  
9 data because that's all there were that were less than 10  
10 square miles.

11 A. That is correct.

12 Q. Okay. So there aren't thousands of data points in those  
13 temperature calculations, but 419.

14 A. Four hundred nineteen samples.

15 Q. Okay.

16 A. To be clear, I think for the judge, because we're talking  
17 about so many different numbers that apply to so many  
18 different things --

19 Q. It is. It is very confusing. I have to agree with you.

20 A. This 419, this is the dataset that we used to identify  
21 the thermal preferences of headwater invertebrates. So it  
22 didn't have to do with habitat stuff or the temperature  
23 distributions. It has to do with the figuring out where these  
24 animals live.

25 Q. Okay. Now, yesterday you said that you believed

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1 something started to happen in these streams at around 2000  
2 microsiemens per centimeter, right?

3 A. No, I didn't say --

4 Q. Oh, okay. What did you say?

5 A. Recall what I said was that based on the laboratory data  
6 and reports out on studies of conductivity that I was aware of  
7 at the time of that testimony --

8 Q. Uh-huh.

9 A. -- that I would think effects on individual organisms  
10 might occur at conductivities greater than 2000, that I would  
11 have greater confidence in such information.

12 Q. Now, you heard testimony yesterday and saw an exhibit  
13 from Kunz et al., right?

14 A. Correct.

15 Q. And that is a WET test performed on Boardtree water; is  
16 that right? Or was it Boardtree water, if you know?

17 A. It wasn't Boardtree water. What Kunz did was to make up  
18 water. So it wasn't from any of these streams. It was an  
19 effort to simulate what the salts might be in various streams.

20 So they basically took water and they added different  
21 salts and they tried to make the waters as close as they could  
22 to the salt composition that's present in some of the streams.  
23 So it's a laboratory mixture of salts.

24 Q. And does that help you form your opinion about 2000  
25 microsiemens per centimeter?

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1 A. I think that work would be consistent with what I've, you  
2 know, basically seen before.

3 Q. What did Kunz say, if you remember, was the level at  
4 which the mayfly genera used there was extirpated?

5 A. I don't have that number specifically in front of me, but  
6 it would be somewhere in the hundreds of microsiemens per  
7 centimeter.

8 Q. Okay. So doesn't that make you think that the number  
9 that one would start to consider conductivity as a  
10 contributing factor would be less than 2000?

11 A. I would look at that result in two ways. I think that's  
12 a piece of evidence, and I'm also aware of the challenge that  
13 they have in actually doing that testing, actually keeping  
14 mayflies alive in the laboratory.

15 So I think I said in my deposition I think this is a step  
16 in the right direction, but more work needs to be done.

17 Q. And which ions are they that are of concern in those lab  
18 tests?

19 A. Well, they didn't differentiate among the ions. They --  
20 so they basically made the mixture up. So the ions that were  
21 present in the mixtures included the ions -- some of the ions  
22 we've been talking about. So you have magnesium. They have  
23 potassium in there, which is something that's not -- we  
24 haven't really been talking about it, but they have potassium  
25 in their salt mixtures. And then they have bicarbonate and

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1 sulfate and calcium.

2 Q. So if water has those ions in it and it comes from a  
3 mine, that would be the kind of thing that the Kunz article  
4 would speak to, right?

5 A. I think the purpose of the Kunz article was to try to  
6 replicate as close as you could in the laboratory some of  
7 these mixtures from a few of the mines.

8 MR. LOVETT: May I approach?

9 THE COURT: You may.

10 BY MR. LOVETT:

11 Q. I've handed you a paper by Soucek and Kennedy. Have you  
12 seen this paper before?

13 A. If I did, I don't remember it.

14 Q. Okay. And it was published in SETAC Press; is that  
15 right?

16 A. Right.

17 Q. Peer-reviewed journal?

18 A. Of course.

19 Q. Okay. Reputable journal?

20 A. Yes.

21 Q. Would you read from the abstract the sentence beginning  
22 halfway through, at the very end of the fourth line, I think,  
23 or fifth line, "Hardness."

24 A. "Hardness also was found to ameliorate sodium sulfate  
25 toxicity to *Ceriodaphnia dubia* and *Hyalella azteca*, with LC50s

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1 for *Ceriodaphnia dubia* increasing from 2,050 milligrams  
2 sulfate per liter at hardness of 90 milligrams per liter to  
3 3,516 milligrams of sulfate per liter at hardness 484  
4 milligrams per liter."

5 Q. Would you continue, please?

6 A. "Using a reformulated MHRW" -- I'm not sure what that is  
7 yet, but --

8 Q. Okay.

9 A. -- "with a similar hardness and higher chloride  
10 concentration and different calcium to magnesium ratio than  
11 that in standard MHRW, the mean LC50 for *Hyalella azteca*  
12 increased to 2,855 milligrams per liter, and the LC50 for  
13 *Ceriodaphnia dubia* increased to 2,526 milligrams per liter."

14 Q. That's all I need. Thank you. Now, what is *Ceriodaphnia*  
15 *dubia*, if you know?

16 A. It's a tiny crustacean.

17 Q. It's not a mayfly, right?

18 A. No.

19 Q. It's much more tolerant of this water than mayflies are,  
20 right?

21 A. Well, it's a -- it's considered to be the most sensitive  
22 standard bioassay test.

23 Q. I understand, but we know from Kunz and from other  
24 experiments that it's not nearly as sensitive as mayflies,  
25 correct?



Menzie - Cross

1 A. I really can't accept that.

2 Q. Okay. You don't know?

3 A. I know enough about toxicological testing that we have,  
4 the Kunz paper, with an animal that's difficult to keep alive  
5 in the lab. So I don't think we have enough information to  
6 make definitive statements about comparative toxicity at this  
7 point.

8 Q. Do you think toxicity data from the outfall at Stillhouse  
9 would be useful to help you form your opinion in this case?

10 A. Yes.

11 Q. Do you know of any such toxicity test that's been  
12 performed at Stillhouse?

13 A. I don't have a recollection.

14 Q. Well, think hard, please. I can tell you that there was  
15 one performed. I'd like to know if you know anything about  
16 it.

17 A. I don't.

18 Q. You don't. Okay. But if you had it, your opinion --  
19 you'd have more confidence; and if there is one and you had  
20 it, that would help you have more confidence in your opinion,  
21 right?

22 A. Those kind of data are useful for an evaluation, yeah.

23 Q. And I would just point out, it's true, isn't it, that the  
24 concentrations -- well, does this show that -- this is  
25 sulfates, right, these levels here, 2855 and 2526?

Menzie - Cross

1 A. You know, a paper like this, I'd really have to spend  
2 time with it, more than I can do sitting here in a couple of  
3 minutes.

4 Q. Would you turn to plaintiffs' notebook, if you see it  
5 there.

6 A. It's not this, right?

7 Q. It's not that one. It will say "Plaintiff" on the front.  
8 10.

9 A. Yeah.

10 Q. And turn to tab 10, please.

11 A. Okay. I'm there.

12 Q. Do you see that? Is that the Kunz paper we were just  
13 discussing?

14 A. It is.

15 Q. Would you turn to page PE 141, which is the second page  
16 of the article.

17 A. Yeah.

18 Q. And about two-thirds of the way down the page, there's a  
19 sentence that begins, "Two of these waters, Winding Shoals and  
20 Boardtree." Do you see that? It's in the second full  
21 paragraph, about two-thirds the way down the column.

22 A. Yeah, got it.

23 Q. Would you read the sentence beginning with "Two of these  
24 waters."

25 A. "Two of these waters, one in Shoals and Boardtree, had

Menzie - Cross

1 ionic signatures representative of alkaline mine drainage  
2 associated with streams affected by mountaintop removal and  
3 valley fill with elevated magnesium, calcium, potassium,  
4 bicarbonate, and sulfate."

5 Q. Okay. Do you agree that's generally the signature of  
6 mine water below valley fills in Southern West Virginia?

7 A. These are the ions that are commonly mentioned.  
8 Potassium is not called out as commonly, but the magnesium,  
9 calcium, bicarbonate, and the sulfate.

10 MR. LOVETT: Okay. Now, may I approach, Your Honor?

11 THE COURT: Yes, you may.

12 BY MR. LOVETT:

13 Q. I've given you a sheet summarizing the water from the  
14 West Virginia database at the outfall at issue here,  
15 Stillhouse, at Stillhouse.

16 Do you see the levels in that water of specific  
17 conductance, for instance?

18 A. Yes.

19 Q. Okay. And would you read for me the levels of magnesium  
20 in the water?

21 MR. MCLUSKY: Your Honor, I object. I don't know  
22 where this document comes from. It's not marked as an  
23 exhibit. Mr. Lovett has him reading from a piece of paper.  
24 If he wanted this in, it should come in in his case.

25 MR. LOVETT: Well --

Menzie - Cross

1 THE COURT: Can you provide some information --

2 MR. LOVETT: These are data -- have you -- you've  
3 seen the West Virginia database, right, for this?

4 THE WITNESS: I've never seen this, no.

5 BY MR. LOVETT:

6 Q. I'm not saying you've seen these numbers, but you've seen  
7 the West Virginia database. It's the same database that you  
8 derived your temperature data from, right?

9 A. I know it exists. We extract data from it.

10 Q. Okay. Well, if these numbers come from that database --  
11 well, let me represent to you they do come from the database.  
12 They were pulled directly from the database.

13 THE COURT: I understand that he's using this as a  
14 demonstrative aid. I'm going to let him. Go ahead.

15 BY MR. LOVETT:

16 Q. So we have magnesium levels in June '11 of 486, right?

17 A. Yes.

18 Q. And what is background level, if you know, for magnesium?

19 A. I don't recall.

20 Q. Is it about 4, or do you not know at all?

21 A. I just don't have it in my mind.

22 Q. And then 419 in September.

23 A. Yes.

24 Q. 458.

25 A. Correct.

Menzie - Cross

1 Q. 371 in October.

2 A. Yes.

3 Q. 255 in November.

4 A. Yes.

5 Q. 437 in January of '12.

6 A. Yes.

7 Q. And then continuing all the way through July of '12, all  
8 over 350. No, there's one 347. Between -- around 400  
9 average. Is that fair?

10 A. Yes.

11 Q. Okay. And with conductance -- these are the same, I  
12 think, conductance numbers we've seen before, usually over  
13 3000 or close to 3000, right?

14 A. Right.

15 Q. And with sulfates -- sulfates in here too? Yes, there  
16 they are. They're all over 2000, right?

17 A. A number of them are, not all of them, but a number of --

18 Q. Almost all of them. Do you know -- do you remember what  
19 the level of concern for sulfates is?

20 A. 50.

21 Q. 50. Would you turn to Plaintiffs' Exhibit 2.

22 MR. MCLUSKY: Your Honor, just before we go there,  
23 I'm going to renew my objection. This is not now a  
24 demonstrative exhibit. He's had him read into the record the  
25 data on which we moved for a directed verdict that they should

Menzie - Cross

1 have put in in their case in chief, and that's what he's  
2 trying to do, is backfill.

3 THE COURT: Well, I don't think you're precluded  
4 from getting into this evidence in your case. It obviously  
5 doesn't help them with regard to evidence they put on, so --  
6 which I reserved judgment on. So go ahead.

7 MR. LOVETT: Thank you, Your Honor. Well, may I  
8 approach, Your Honor?

9 THE COURT: Yes, you may.

10 BY MR. LOVETT:

11 Q. I'm going to show you a copy -- we'll just speed things  
12 up -- of Plaintiffs' Exhibit 2. It's the "How Many Mountains"  
13 paper.

14 A. Uh-huh.

15 Q. Would you read from that the underlined sentence in the  
16 abstract?

17 A. "We find this threshold is reached once surface coal  
18 mines occupy greater than 500 percent of their contributing  
19 watershed area, ionic strength exceeds 308 microsiemens per  
20 centimeter, or sulfate concentrations exceed 50 milligrams per  
21 liter."

22 Q. Do you have any reason to doubt that, the truth of that  
23 sentence?

24 A. With respect to what?

25 Q. Do you believe that -- with respect to the sentence, do

Menzie - Cross

1 you believe that the threshold is reached for surface mines or  
2 once surface coal mines occupy -- well, strike that part.

3 Just that the -- when the ionic strength exceeds 308  
4 microsiemens per centimeter or sulfate concentrations exceed  
5 50 milligrams per liter?

6 A. I think my presentation of information yesterday is a  
7 basis for disagreeing with that statement, yes.

8 Q. It's true about the conductivity, but do you also agree  
9 or disagree with the sulfate levels?

10 A. I definitely would disagree with that.

11 Q. What do you base that on? The same kind of testimony as  
12 you base your disagreement with the conductivity levels?

13 A. Correct.

14 Q. Do you know what the central limit theorem in statistics  
15 is?

16 A. Yeah, roughly.

17 Q. Would you tell me what it is?

18 A. Actually, I don't have a good definition for the central  
19 limit theorem.

20 Q. Okay. So you don't roughly know?

21 A. No, not that I would want to speculate on. No.

22 Q. All right. Now, you looked at temperature. You  
23 looked -- your graphs compare directly habitat with WVSCI,  
24 don't they?

25 A. Yes.

## Menzie - Cross

1 Q. But you did not do that for temperature, did you?

2 A. No. I compared temperature to the temperatures at which  
3 shifts in organisms would occur that could affect WVSCI.

4 Q. Yeah, but why didn't you do the obvious step that you did  
5 with -- let me ask you, did you ever run the analysis by  
6 comparing directly WVSCI with temperature?

7 A. Yes.

8 Q. Why isn't that included?

9 A. I haven't, but I've done that analysis. I have the -- if  
10 it helps to have a demonstrative on that, I can show that  
11 comparison. It reduces the WVSCI score if you have higher  
12 temperatures.

13 Q. Yeah, but you have an expert report whose point is to  
14 show that -- or one of the two points is to show that higher  
15 temperatures lead to low WVSCI scores. And you didn't include  
16 that in your report?

17 A. I inferred it from the work I did, but I've done that  
18 analysis. It's statistically lower if you have higher  
19 temperature and WVSCI -- WVSCI decreases.

20 Q. That's a pretty general statement here without having  
21 ever put it in your report so that it would be subject to  
22 review or even discussion.

23 A. Well, some of this, I could provide a demonstration of  
24 what that looks like.

25 Q. No, I don't want you to now. It's too late. I'm just



Menzie - Cross

1 surprised that you didn't do it originally.

2 A. Well, it decreases with increasing temperature.

3 Q. And you understand that Drs. Palmer and King agree that  
4 WVSCI will decrease with increasing temperature at some point,  
5 right?

6 A. I'd have to look at their testimony. I'm not sure what  
7 they said about it.

8 Q. Well, all ecologists -- or all competent ecologists are  
9 going to agree that at certain temperatures, though, WVSCI  
10 scores would decline, right?

11 A. What I would say is the analysis I've done is if you have  
12 temperatures greater than 21 degrees, you have significantly  
13 lower WVSCI scores than if you have temperatures that are less  
14 than 19 during the summer.

15 Q. Okay. Did you perform that analysis before your expert  
16 report was turned in?

17 A. No, after.

18 Q. Okay. Would you turn to Joint Exhibit 64. I'm sorry. I  
19 hope this is the last notebook we're in here.

20 A. That's another notebook.

21 Q. It's the notebook we were in before.

22 Have you seen this before? Oh, I'm sorry. You don't  
23 have it yet. Take your time.

24 A. I probably have seen this or parts of this. I'm guessing  
25 this is from the West Virginia SOP for station selection.

Menzie - Cross

1 Q. Yes. It tells us how to choose where to sample for an  
2 RBP, right?

3 A. Yes. There's lots of pieces to the SOP, but I'm sure  
4 I've kind of gone through this before at one time or another.

5 Q. Okay. Would you turn to page JE 887 there, please, and  
6 look at numeral 5. Would you read numeral 5, please.

7 A. "Assessments are connected upstream of and should not  
8 include roads, bridges, culverts, if possible."

9 Q. And that where -- and that is the methodology that was  
10 followed by Dr. Swan in this case, right?

11 A. If you want to exclude the flume, the concrete flume as  
12 not being a culvert, yes.

13 Q. Well, a flume is not a culvert, is it?

14 A. No. A culvert would be completely circular.

15 Q. On the other hand, the sampling point that -- or the  
16 place that the DEP and your colleague did their RBPs was  
17 downstream of culverts, wasn't it?

18 A. Yes.

19 Q. In fact, it's between two culverts, isn't it?

20 A. That's correct. The entire stream is culverted.

21 Q. Well, not the part where Dr. Swan did his RBP, right?

22 A. Dr. Swan sampled between a culvert and a concrete  
23 spillway.

24 Q. But the culvert was below him, wasn't it?

25 A. And the concrete spillway was just above him.

Menzie - Cross

1 Q. I understand. And why is it that, if you know, RBPs  
2 aren't supposed to be taken downstream of culverts?

3 A. They modify flow.

4 Q. And especially when it's between two culverts, right?

5 A. Right.

6 Q. So the flow between those two culverts would not be a  
7 natural flow, would it?

8 A. None of the flow here is natural.

9 Q. And now would you turn to Joint Exhibit 81, which I think  
10 is the last one in this book.

11 Okay. This is what you testified about yesterday, the  
12 DEP RBP, right?

13 A. Yes.

14 Q. Have you examined this whole document?

15 A. Probably not recently. I've seen it before.

16 Q. And you know, don't you, that there are other assessments  
17 of embeddedness in this document in addition to the one you  
18 testified about yesterday?

19 A. I'd have to really go back and look at it because I  
20 haven't really been thinking about other assessments.

21 Q. Well, you picked the worst one out of a series of about,  
22 I think, nine. Nine, didn't you?

23 A. I would really -- if we can -- if I can look at this at  
24 the break at the same time as I --

25 Q. Let's go through them now.

Menzie - Cross

1 A. -- get you this other information, then I --

2 Q. No, let's go through them now. You have the document in  
3 front of you.

4 A. Okay.

5 Q. So first let's look at JE -- so the first page is JE 967,  
6 right?

7 A. Right.

8 Q. And that shows that the following sample was taken on  
9 10/27/2011, right? Do you see the date? It's on the third --  
10 fourth line from the top, on the left.

11 A. Yes, October 27th, 2011.

12 Q. And if you turn the page, you'll see the DEP assessment  
13 at that spot at Stillhouse for rate of riffles or runs, rate  
14 of pools and deposition areas, and determine left/right by  
15 facing stream, right? I guess -- no, I'm sorry. The last one  
16 is embeddedness, isn't it?

17 A. Well, on my second page, let's see --

18 Q. Should be 968.

19 A. Yeah, my second page I've got a score for embeddedness.

20 Q. And what's the score for embeddedness?

21 A. 12.

22 Q. 12. Yeah, I see now. I was wrong. Embeddedness is 12.  
23 And sediment deposition is what?

24 A. 12.

25 Q. And bank stability is what?

Menzie - Cross

1 A. 6 and 7.

2 Q. We're not really concerned about bank stability, though,  
3 here, are we? Most of your testimony has been about  
4 embeddedness and deposition, right?

5 A. Well, I don't know exactly where this location is. Do we  
6 have a map so we can kind of talk about it?

7 Q. Is it not the same location as the sampling point that  
8 you testified about?

9 A. Without a map, I don't think we can say.

10 Q. Okay. Well, one thing you do know about it, it's  
11 Stillhouse Branch, right, because it says that? Yeah, we can  
12 figure this out. Let's look at the first page. Stillhouse  
13 Branch.

14 A. Got that.

15 Q. Do you see where it also then says 0 mile length,  
16 000 miles from mouth?

17 A. So this isn't in Stillhouse.

18 Q. This says Stillhouse Branch. It's at the mouth of  
19 Stillhouse Branch.

20 A. It's 000. This is right at the mouth of Stillhouse.  
21 This isn't in Stillhouse.

22 Q. It's right at the mouth of Stillhouse.

23 A. But not in Stillhouse. This is a location on the  
24 Twentymile.

25 Q. Let's look at page 1064. I can't -- that's Defendant's

Menzie - Cross

1 Exhibit -- I'm trying to figure out which page it is here. JE  
2 1006.

3 A. Okay.

4 Q. That's the one you testified about yesterday, right?

5 A. Right.

6 Q. And that's the one where the embeddedness level that you  
7 pointed to was 2.

8 A. Correct.

9 Q. This says stream location, Stillhouse Branch, near mouth.

10 A. Right. So this is upstream. This is upstream --

11 Q. This says AN code 0.0. Isn't that exactly the same as  
12 the one that I just pointed you to?

13 A. I'm aware of sampling in Twentymile right at Stillhouse  
14 but not in Stillhouse. So without the map, I don't -- I think  
15 we're speculating as to where that location is. This is near  
16 the mouth. This is up in Stillhouse.

17 Q. Well, why would DEP take -- these are a series of RBP-  
18 like assessments by DEP, right?

19 A. That's correct.

20 Q. And DEP does that all at the same place, doesn't it? Why  
21 would one be different from the others?

22 A. DEP has a number of sampling points in Twentymile, some  
23 above, at, and below Stillhouse.

24 THE COURT: Doctor, look at page 969, up at the top.  
25 It also shows this AN code as 0.0. It's got the same date.

Menzie - Cross

1 Is that part of the site sample that was taken?

2 THE WITNESS: Yeah, these -- this goes with the --  
3 with that sampling location that we were just talking about a  
4 little bit earlier on it. This goes with this particular date  
5 of October 27th, 2011.

6 BY MR. LOVETT:

7 Q. All right. And it also says quarterly, right, down  
8 there; how often it happens?

9 A. Which page are you looking at?

10 Q. I'm looking at the same page the judge just referred you  
11 to, page 967, sampling. It's difficult to read, but I think  
12 this is the sampling, how often samples occur, and it says  
13 quarterly.

14 A. Yes, and I need to spend more time with this, but if you  
15 look at distance, we have some kind of measure there that we  
16 could maybe figure out. You know, they're having -- I'm not  
17 sure what that distance is.

18 Q. Isn't it just common sense that, first of all, if it's  
19 done quarterly, it's going to be done in the same place, but  
20 that the code and the mile marker 00 is identical to the one  
21 that you testified about yesterday? I mean doesn't all the  
22 evidence lead us to conclude that these are the same sampling  
23 points?

24 A. I can't -- I can't conclude that from this evidence.

25 Q. Okay. Well, let's look at them, in any event. On this

Menzie - Cross

1     October 27th number, date, we have embeddedness of 12,  
2     sediment deposition of 12, right? It's on page JE 968.

3     A.    Yes.

4     Q.    And as I understand it, 10 is the cutoff between marginal  
5     and suboptimal, right?

6     A.    Right.

7     Q.    So this is suboptimal.

8     A.    Correct.

9     Q.    Okay. Let's turn to the next one. It says stream name,  
10    Stillhouse Branch. It doesn't say Twentymile, does it?

11    A.    No, but I was saying that it's very possible to have  
12    sample locations that are located along --

13    Q.    Okay.

14    A.    And sort of identifying where they are.

15    Q.    It has the same code on it, doesn't it?

16    A.    Yes.

17    Q.    Okay. And it has a bunch of lab data, right? Is there  
18    anything there from that sample that -- that relates, I guess,  
19    to the previous RBP, right?

20    A.    Let me just check the date.

21    Q.    Okay.

22    A.    So this is -- so this is, again, October 27, 2011, and  
23    this looks like, yes, it's associated with -- this was  
24    collected on October 27th, 2011.

25    Q.    Right.



Menzie - Cross

1 A. Right.

2 Q. And do you see on page 971 -- will you turn to page 971?

3 A. Yeah.

4 Q. What's the magnesium level on that day?

5 MR. MCLUSKY: Your Honor, for the same reason we  
6 objected earlier, this is stuff that should have come in in  
7 their case in chief. We put no water chemistry data in.

8 THE COURT: Overruled.

9 THE WITNESS: 371.

10 BY MR. LOVETT:

11 Q. Okay. Let's turn, then, to the next one, which is same  
12 sample location, 11/29/11, page JE 975. Do you see that?

13 A. Yes.

14 Q. Were you aware of these sheets when you testified  
15 yesterday?

16 A. I did a pretty thorough review of things in the  
17 Twentymile just for, you know, my own background. So I -- but  
18 for this case, I haven't looked at these. But I'm looking at  
19 this -- for example, this is a location and it's coarse  
20 gravel.

21 Q. It's the same AN code and miles to mouth, right?

22 A. Right. There's no indication here of deposits or  
23 anything, except the 2 for manganese.

24 Q. So the -- okay. What is the embeddedness number on that  
25 day?

Menzie - Cross

1 A. It would be 11.

2 Q. Am I reading it wrong? I thought it was 12.

3 A. I'm looking -- I'm on page 976.

4 Q. I guess I turned back. I'm sorry. 11, right. And what  
5 about the deposition?

6 A. 11.

7 Q. Both of them, again, are suboptimal, not marginal, right?

8 A. Right.

9 Q. And this is the category that you left out of your  
10 analysis of habitat, correct?

11 A. Right. I didn't include suboptimal.

12 Q. Okay. Here we have some more information about the  
13 sampling location, the width and depth and velocity, on page  
14 977 describing this site.

15 Does that give you any information that would help you  
16 decide where this was taken?

17 A. No. Without a map, I, you know, I really don't know.

18 Q. Okay. This is a joint exhibit. So I don't -- I think  
19 this is admitted already and I don't need to make you read  
20 everything, but let's quickly go through and look at some  
21 other dates.

22 Page 982. The next one, embeddedness, is what?

23 A. It's a 10.

24 Q. Sediment deposition?

25 A. A 10.

Menzie - Cross

1 Q. Okay. Same location? WEKG 5-000?

2 A. Yes.

3 Q. Okay. Let's turn to page 987. This is from 1/10/12.

4 Same location, right?

5 A. What page are you on?

6 Q. JE 987.

7 A. Right.

8 Q. Okay. And let's turn the page. Embeddedness is 8 and

9 sediment deposition is 8.

10 A. Yes.

11 Q. So that's marginal, right?

12 A. Right.

13 Q. And this illustrates your sort of analysis of the problem

14 with the RBP, doesn't it? It's subjective, and changing

15 locations even a little bit will change the RBP.

16 A. I agree with that.

17 Q. Let's turn to the next one, which is JE 993. 3/13/12.

18 Embeddedness is 11 and deposition is 11, right?

19 A. Correct.

20 Q. Suboptimal, correct?

21 A. Yes.

22 Q. The next one is at JE 999. And it has, on page 1000,

23 12 for embeddedness and 11 for sediment deposition, right?

24 A. Right.

25 Q. Again, suboptimal?

Menzie - Cross

1 A. Right.

2 Q. Okay. And then we have Stillhouse again on 4/03/12. Do  
3 you see that at page 1003; right?

4 A. Yeah.

5 Q. This is the one that you testified about in the past; is  
6 that correct? Yesterday. Or is it?

7 MR. MCLUSKY: I think it's 1006.

8 THE WITNESS: Right. Looks like it is.

9 BY MR. LOVETT:

10 Q. Yeah. So it starts with 1003 and then continues with the  
11 map on 1006. Maybe I'm mistaken. But in any event, the data  
12 we're going to gather from the testimony you gave yesterday,  
13 and that is the low embeddedness number of 2, right?

14 A. Are you --

15 Q. 1010.

16 A. Right.

17 Q. Then we turn to 1023, page 1023 for 6/20/12, right?

18 A. Correct.

19 Q. And 1033 has scores I think of 10 and 11 for  
20 deposition -- embeddedness 11 and deposition 10? It's hard to  
21 tell, but that's what I got from it. I'm very confident of  
22 the 11.

23 A. Sure.

24 Q. So it looks like 11 and 10, doesn't it?

25 A. Yeah.

Menzie - Cross

1 Q. Okay. Have you been noticing -- I won't ask you about  
2 some of these, but have you noticed the magnesium in high  
3 levels as you've moved through the document?

4 A. I hadn't been tracking that as I turned the pages.

5 Q. All right. Now, you said that the Stillhouse data,  
6 temperature data that you used was from eight to thirteen.

7 A. Correct.

8 Q. We asked you at your deposition to provide the data for  
9 your temperature assessments, didn't we?

10 A. Yes.

11 Q. And you sent us those, right?

12 A. Yes.

13 Q. And you sent us the years 2010 to 2011 -- or, yeah, 2010  
14 through '13; is that right?

15 A. There were two datasets. So there was an earlier set and  
16 a later set. So they came as separate files. So they should  
17 have come as separate files.

18 Q. Okay.

19 MR. MCLUSKY: Your Honor, I'd just note that the  
20 defendant's supplemental discovery response on March 14, 2013  
21 I'm told had both datasets provided to the plaintiffs.

22 THE COURT: All right. Thank you.

23 MR. LOVETT: May I approach?

24 THE COURT: You may.

25 BY MR. LOVETT:

Menzie - Cross

1 Q. Now, I'll represent to you that this is the data that we  
2 just went through in a box plot.

3 Does it -- I mean I know you haven't had time to think  
4 about whether or not it's accurate, but does it appear to be  
5 about the numbers we just went through? Is that what you'd  
6 expect to see on that box plot?

7 A. Yeah. Basically this box plot shows a median somewhere  
8 around, for embeddedness, around 11.

9 Q. Right.

10 A. Sediment deposition, 10ish. And I guess that's bank  
11 stability around -- maybe it's a 12.

12 Q. Well, we might have some testimony about exactly what it  
13 is, but I believe it's 11, around 11, 11 and 12. Does that  
14 look reasonable given that box plot?

15 A. That would be reasonable.

16 Q. So if we take all those together, Stillhouse is  
17 suboptimal. It's not marginal, right?

18 A. But the thing that obviously that I shared was that, you  
19 know, I'm aware of the -- what I understood to be the more  
20 complete hundred meter or as large a review as you could have  
21 that was represented in the map that we discussed here  
22 yesterday, plus our own observations on Stillhouse that  
23 basically confirmed those observations.

24 So I just don't know where this location is that we're  
25 talking about. So I don't think I can say with any certainty

Menzie - Cross

1 that this is representative of Stillhouse.

2 Q. Okay. Do you have a document that shows the RBP that  
3 your person took?

4 A. I don't have that with me, no.

5 Q. You've never provided it, have you? I mean it's not part  
6 of this record.

7 A. Correct.

8 MR. MCLUSKY: It has been provided to the  
9 plaintiffs.

10 MR. LOVETT: I mean it's not part of the record of  
11 this case, is it? It's not in any of these exhibits, right?

12 THE WITNESS: No.

13 BY MR. LOVETT:

14 Q. Okay. And you also know Dr. Swan performed an RBP,  
15 right?

16 A. Correct.

17 Q. And that also found suboptimal habitat, didn't it?

18 A. Yes.

19 Q. In different locations, right?

20 A. In a different location.

21 Q. Did you plot the stream temperature versus forest cover  
22 from the DEP database?

23 A. I haven't done that analysis.

24 Q. That would be an interesting thing to see, wouldn't it?

25 A. If you could do it properly, it would be interesting to

Menzie - Cross

1 look at. I haven't done it.

2 Q. You haven't done any statistical analysis at all, have  
3 you, for this case?

4 A. I've presented you quite a bit of information.

5 Q. You provided us information, but you've run no  
6 statistical test on any of it, have you?

7 A. I've compared the differences between the temperatures  
8 post-report as you brought -- you brought in and introduced my  
9 paper; and in my paper, I did an analysis of variance to  
10 compare the temperature differences between the different  
11 classes of conductivity waters, and then I tested that to see  
12 which months were significantly different on the basis of  
13 conductivity, and as indicated in the paper --

14 Q. You did that in your paper, but you didn't do it in your  
15 expert report or any of your testimony here, have you?

16 A. All of my box plots provide the probabilities or the  
17 frequencies that can easily be read off of --

18 Q. Did you run a -- Dr. -- or Miss Kuehn, I think she  
19 thought that, as well as EPA, that a multivariate analysis was  
20 necessary to establish causation and to eliminate confounding  
21 factors.

22 Did you run a multivariate analysis of any kind on these  
23 data?

24 A. I have done that.

25 Q. It's not part of -- you haven't disclosed it, have you?



Menzie - Cross

1 A. No. I'm still working on a paper on that.

2 Q. Okay. Did you even run a -- is it called a univariate  
3 analysis in the paper?

4 A. We've done univariate analyses and multivariate analysis  
5 to kind of parse apart the effects of temperature and habitat  
6 on WVSCI scores.

7 Q. You've done those, but you didn't make them part of your  
8 expert report, right?

9 A. I was still working on it. That's correct.

10 Q. And you have not testified about it on direct  
11 examination, have you?

12 A. No, just now. I can share it with the Court if there's  
13 interest in that.

14 Q. None of these -- none of your report has been peer-  
15 reviewed in any way, has it?

16 A. It's internally peer-reviewed, certainly. The paper is  
17 out for peer review now.

18 Q. What paper?

19 A. The paper I submitted to *Environmental Science and*  
20 *Technology*.

21 Q. When did you submit it?

22 A. Probably about a week or two ago.

23 Q. A week or two ago? And that's the draft that you  
24 provided to us back in June?

25 A. Revised somewhat since then.

Menzie - Cross

1 Q. Okay. And when did you -- and you said you alerted EPA  
2 to your concerns. When did you do that?

3 A. Last week.

4 Q. Last week? What did EPA tell you?

5 A. They're reviewing the information. They wanted to share  
6 it more broadly and that they would be -- I invited them to  
7 have conversations with me about it.

8 Q. With whom did you share it?

9 A. Cormier and Suter.

10 Q. Okay. And did you talk to them on the phone or write  
11 them an e-mail and send it? What was it?

12 A. Basically we're exchanging e-mails.

13 Q. You haven't spoken with them.

14 A. No, but I plan to.

15 Q. Uh-huh. You don't have those e-mails with you, do you?

16 A. No, but I can provide them if that's necessary.

17 Q. No, that's fine at this point. On the other hand, all of  
18 the papers that are in plaintiffs' exhibits and that were  
19 testified about have been peer-reviewed by many different  
20 journals, right?

21 A. You mean by different people?

22 Q. I mean, well, people and journals. I think that you  
23 heard Dr. Palmer testify I think that there were 20 articles,  
24 about. Do you remember that?

25 A. I remember her mentioning that number.

Menzie - Cross

1 Q. Fifty different peer reviewers on -- or fifty different  
2 authors of those papers?

3 A. Correct.

4 Q. All in peer-reviewed journals, right?

5 A. That's right.

6 Q. The benchmark, of course, thoroughly reviewed. Would you  
7 agree with that?

8 A. I would agree that it was reviewed. It wasn't thoroughly  
9 reviewed, obviously.

10 Q. Well, do you know Dr. Yuan?

11 A. I don't know Dr. Yuan.

12 Q. Do you know of him?

13 MR. MCLUSKY: Your Honor, we're just arguing with  
14 the witness now. I mean it was reviewed. That's all we know.

15 THE COURT: Well, he's asking about a particular  
16 member of the panel. Go ahead.

17 THE WITNESS: I don't know Dr. Yuan.

18 BY MR. LOVETT:

19 Q. Okay. Do you believe that the panel that reviewed,  
20 excluding yourself, of course, the benchmark was competent, is  
21 a competent panel?

22 A. I know from my own experience, since I was a reviewer,  
23 how easy it is to miss what we've been discussing.

24 Q. You were careless when you reviewed it.

25 A. It wasn't even provided with the information. If you

Menzie - Cross

1 don't see that part of it, you'll never know.

2 Q. That's interesting. Do you mean to tell me that you  
3 think the reviewers didn't know what kind of data they were  
4 reviewing?

5 A. I'm thinking that's very likely.

6 Q. Really? Don't you think that ecologists know that when  
7 they get data from a state agency what kind of data it is?

8 A. I wouldn't bet on it.

9 Q. Did you know it? Did you miss that?

10 A. Well, we weren't afforded with any information on the  
11 nature of the database.

12 Q. You knew it came from the DEP database.

13 A. Yes. That's all we knew.

14 Q. You have great familiarity with agency databases, don't  
15 you?

16 A. I have no familiarity with the West Virginia database.

17 Q. This is the way all state databases work, isn't it? It's  
18 a compilation of data collected by the agency at particular  
19 points for particular purposes, what you call snapshot data.  
20 That's the way it is in every state, isn't it?

21 A. I don't think academic scientists would automatically  
22 presume that they would know that type of information.

23 Q. Really?

24 A. I don't think it would be obvious.

25 Q. In any event, it's your testimony that when you reviewed

Menzie - Cross

1 it, you didn't understand that the DEP database was a series  
2 of snapshots.

3 A. I didn't understand that completely, and I didn't  
4 understand the full ramifications of it. That's correct.

5 MR. LOVETT: Okay. Thank you. That's all I have,  
6 Your Honor.

7 THE COURT: All right. Are you going to have  
8 redirect?

9 MR. MCLUSKY: I am, Your Honor.

10 THE COURT: Let's take a ten-minute recess first.

11 (Recess from 10:30 a.m. to 10:45 a.m.)

12 THE COURT: All right. Doctor, if you'll resume the  
13 stand.

14 All right. Are we ready?

15 MR. MCLUSKY: Mr. Lovett may have remembered he had  
16 a question about the temperature database that was unanswered  
17 that Dr. Menzie was going to address.

18 THE COURT: All right. Go ahead, Doctor.

19 BY MR. LOVETT:

20 Q. The question I think is what years of the West Virginia  
21 database did you use to derive the temperature figures that  
22 are in your report or in the exhibits?

23 A. So I conferred with my colleague, and the database that  
24 we -- the years that we've used I think are 1997 or '96 to  
25 2008.

Menzie - Cross

1 Q. 2008?

2 A. Yeah.

3 Q. And I want to make sure I remember the testimony before,  
4 that the years at Stillhouse are 2008 to 2013?

5 A. Yes.

6 Q. All the way through 2013 or just in the beginning, if you  
7 know?

8 A. I don't know exactly.

9 Q. Okay. So the databases don't overlap, do -- or the data  
10 don't overlap in time, do they?

11 A. No.

12 MR. LOVETT: May I approach, Your Honor?

13 THE COURT: You may.

14 BY MR. LOVETT:

15 Q. I'm showing you something that was just down -- we just  
16 downloaded from the West Virginia average temperature from  
17 April to August for a series of years. Do you see that?

18 A. Yes.

19 Q. And you see right at 2008, there's a significant spike in  
20 temperature, isn't there?

21 A. Yes.

22 Q. Those were very hot years, right?

23 A. Yes.

24 Q. And do you agree generally that 2008, '09, '10, '11, and  
25 '12 were hot years?

Menzie - Cross

1 A. Based on this graph from wherever it is.

2 Q. Okay. And the data that you used from the database are  
3 in the cooler years, correct?

4 A. Correct.

5 Q. But the data you used from Stillhouse are in the hotter  
6 years, right?

7 A. Again, if this represents -- which I don't think this  
8 represents necessarily temperature at Stillhouse, but --

9 Q. Okay.

10 A. -- during that period.

11 MR. LOVETT: Okay. May I approach?

12 THE COURT: You may.

13 BY MR. LOVETT:

14 Q. Now, these are numbers that were taken from -- for the  
15 years 2008, '09, '10, '11, and '12 from your Stillhouse data  
16 sheets. Do you see those?

17 A. Correct. Yeah.

18 Q. And do you see how much higher it is in 2011 and '12 than  
19 it was in 2008 and 2009?

20 A. Yes.

21 Q. And if you projected it backward further than that to  
22 2007, wouldn't you see numbers much more -- well, assuming --  
23 I agree. Assuming that NOAA is correct, wouldn't you see  
24 numbers much lower in Stillhouse going back to 1999?

25 A. Can you tell me what the location is for this sampling

Menzie - Cross

1 station?

2 Q. It is your data that you used that you provided to us for  
3 the Stillhouse sampling.

4 A. Oh, this is data from Stillhouse?

5 Q. Yes.

6 A. Okay.

7 Q. Yes. These are Stillhouse data that you provided to us.

8 A. Uh-huh. Okay.

9 Q. So this is what you would expect given the NOAA data,  
10 isn't it?

11 A. I don't want to -- I really don't want to speculate on  
12 this. I haven't looked at this data in any kind of detail to  
13 know what it represents.

14 Q. Well, shouldn't you have looked at it since you used it  
15 as the basis of your expert report?

16 A. I basically presented the information I have, but I have  
17 not analyzed the data in this particular way.

18 Q. So the highest median temperature came in 2011, right, at  
19 23 degrees?

20 A. Correct.

21 Q. But the median temperature in 2008 and 2009 were  
22 somewhere around 20.5.

23 A. Correct.

24 Q. And if you look at these numbers, if the -- wouldn't you  
25 agree that the NOAA temperature data for West Virginia, which



Menzie - Cross/Redirect

1 I agree is much broader than just Stillhouse, though, that  
2 those data look like they match the data at Stillhouse?

3 A. Yeah.

4 Q. Okay.

5 A. There might be -- there might be some other things going  
6 on here. I just really can't render an opinion on this.

7 Q. You haven't looked at it, right?

8 A. I haven't looked at it.

9 MR. LOVETT: Thank you.

10 THE COURT: All right. Redirect?

11 REDIRECT EXAMINATION

12 BY MR. MCLUSKY:

13 Q. Dr. Menzie, I'm looking at the two demonstrative exhibits  
14 Mr. Lovett just had. The West Virginia average temperature  
15 April through August looks like it peaks in 2010 and starts to  
16 drop thereafter up till 2013; is that correct?

17 A. That's correct.

18 Q. And if I look at the median summer temperature at  
19 Stillhouse, it doesn't follow that trend at all, does it?

20 A. No.

21 Q. It actually continues to rise as the average temperature  
22 in West Virginia drops?

23 A. That's correct.

24 Q. All right. Would you -- let me direct your attention to  
25 Joint Exhibit 81, which were the stream assessment forms

## Menzie - Redirect

1 Mr. Lovett walked you through. Let me know when you get  
2 there.

3 A. I'm there.

4 Q. All right. If you flip through all of those stream  
5 assessment sheets for the various dates in there, is it fair  
6 to say that the only date for which there is a complete RBP  
7 assessment of all of the categories that are required to reach  
8 an RBP score is the one that you testified about yesterday,  
9 that is, for May of 2012?

10 A. That was my impression.

11 Q. And the rest of them all have two or three categories  
12 that are assessed, but they don't have a full RBP score. Is  
13 that fair?

14 A. That's correct.

15 Q. And then this little chart that Mr. Lovett held up, a box  
16 plot that has embeddedness, sediment deposition, and stability  
17 on it, represents not an RBP score but just partial scores  
18 that comprise part of the whole RBP; is that correct?

19 A. That's correct.

20 Q. And the only scores that have ever been taken of  
21 Stillhouse in the lower reaches that we're aware of that DEP  
22 assessed are all in the marginal range; is that correct?

23 A. That's correct.

24 Q. Let me direct your attention to Joint Exhibit 75 for just  
25 a moment. And, Mr. Tyree, could you put that up? It should

Menzie - Redirect

1 be page JE 595.

2 A. I have it.

3 Q. This is the exhibit you talked about yesterday that shows  
4 optimal habitat as opposed to poor/marginal habitats arranged  
5 by conductivity.

6 I think what Mr. Lovett is suggesting is that the blue  
7 bars where you have poor/marginal habitat should have included  
8 some category of suboptimal because that's what Dr. Swan found  
9 or maybe some of these subcategories.

10 Have you calculated if you replaced the blue bars and  
11 used an RBP score of 130 as the breakoff point, that is,  
12 replaced the blue bar with 130 and below RBP scores, what that  
13 does to your blue bars in Joint Exhibit 75?

14 A. I have made that kind of calculation.

15 Q. What does it do?

16 MR. LOVETT: Objection, Your Honor. This is outside  
17 the scope of his expert report.

18 THE COURT: Well --

19 MR. LOVETT: We have never seen this or had the  
20 opportunity to prepare for this examination.

21 THE COURT: You raised these matters -- you raised  
22 these matter in your cross. Go ahead.

23 THE WITNESS: It still shows the same pattern.  
24 Basically if you've got a score of 130, if you go up to 130,  
25 include that, you're still seeing this kind of pattern.

## Menzie - Redirect

1 BY MR. MCLUSKY:

2 Q. Meaning that up to an RBP score of at least 130, you  
3 would not expect to get a passing WVSCI score regardless of  
4 the conductivity level.

5 A. It's more likely than not if you are below 300 and have a  
6 score of 130 or less, you're going to have a failing WVSCI  
7 score.

8 Q. Thank you. Was there anything else you wanted to  
9 explain? I don't have any further questions, but is there  
10 something you thought went unexplained as a result of the  
11 cross-examination?

12 A. I think there's been a fair amount of questions asked,  
13 but I think from my perspective there are a couple of very  
14 important things that are going on in Stillhouse as an  
15 ecologist. Walking to Stillhouse and looking at Stillhouse  
16 relative to other streams I've seen, it's highly engineered.  
17 It's basically a drainageway.

18 And as an ecologist simply looking at that, I would not  
19 expect to find the kinds of communities that would be living  
20 there as would be living in those reference streams for which  
21 the WVSCI was developed. It's completely different. And so  
22 it shouldn't be any surprise that that particular stream, as  
23 modified as it is, would not support the types of communities  
24 that there would be in a reference stream running down the  
25 side of a mountain. And it just really departs from that in

Menzie - Redirect

1 almost every way.

2 MR. MCLUSKY: One more followup, if I might, Your  
3 Honor.

4 BY MR. MCLUSKY:

5 Q. The DEP site assessment records at Joint Exhibit 81, if  
6 you were to assume all of those are actually in Stillhouse --  
7 and I know you may not have gone through them in any depth  
8 here this morning -- but are they consistent with a pattern of  
9 perhaps episodic deposition of manganese hydroxide on the  
10 stream as a result of inadequate manganese treatment?

11 A. Yes. Basically manganese is, I think as everyone knows,  
12 is a metal that sometimes requires treatment. And as I  
13 understand it, during the operational history of this  
14 particular facility, which I guess went through 2012, that was  
15 required very, very commonly.

16 As I understand it, that treatment now is phasing out  
17 because the facility has basically been closed out. But there  
18 was a period at least up through 2012 and a little bit in 2013  
19 when manganese treatment was required and, you know, generated  
20 these kinds of precipitates that got carried over to their  
21 pond. It should settle in the pond. They got carried over  
22 and settled in the stream and sort of affect the conditions  
23 that you see there.

24 MR. MCLUSKY: Thank you. That's all I have.

25 THE COURT: All right. Recross?

Menzie - Recross

RECROSS EXAMINATION

BY MR. LOVETT:

Q. So your understanding is that there used to be manganese deposition problems at the mine, but they're no longer there?

A. No. What I was saying is that there was a need for much more treatment of manganese in the past than at present.

Q. And so that deposition won't be occurring now to that extent, right?

A. The depositions should begin to fade out, and the materials that are deposited that have been seen, you know, in the various parts of the creek should over time anyway beginning to ameliorate.

Q. Now, did I just hear you testify that you -- you believe that if you took the number of -- did you say 130? Let's look at JE 959, which is what Mr. McLusky pointed you to, page JE 959.

If you had changed the number -- what was the number you said wouldn't change the box plots any?

A. 130 and lower.

Q. 130 and lower. So is it true that suboptimal is about 110? Is that where the suboptimal level begins?

A. It's probably around 120.

Q. So is it your testimony that streams -- that suboptimal streams in West Virginia are all impaired?

A. No, not all of them.

Menzie - Recross

1 Q. That they fail the WVSCI?

2 A. No, not all of them.

3 Q. Do most of them? Do you have any idea?

4 A. I don't.

5 Q. You don't know at all, do you?

6 A. I think it's the watershed and the temperature and  
7 everything else combined.

8 Q. You just testified that it would.

9 A. No. We were just talking about habitat and these  
10 particular conditions in Stillhouse.

11 Q. Okay. Back to these exhibits I gave to you, the median  
12 summer temperature from Stillhouse and the West Virginia  
13 average temperature from NOAA.

14 A. Right.

15 Q. Now, 213 was a cool year, wasn't it? 2013 was a cool  
16 year, wasn't it?

17 A. I don't have any personal experience of remembering from  
18 that point of view.

19 Q. Okay. But if it was a cold -- a cool year, you know,  
20 don't you, that the data in -- that you used don't include  
21 anything except for the first quarter of 2013?

22 A. Again, I didn't remember exactly.

23 Q. Well, think back. Is that likely?

24 A. I don't remember.

25 Q. Okay. And let's compare -- so we don't have -- if we

## Menzie - Recross

1 don't have data from 2013 where there's a big drop on the NOAA  
2 but only from '10, '11, and '12, aren't '10, '11, and '12 the  
3 highest three years in temperature?

4 A. Well, the way this is plotted, it accentuates -- you  
5 know, this is a -- what they call a plot that kind of starts  
6 at a very high temperature to make it look like it's big  
7 peaks. So if you look at this plot, you're basically looking  
8 at a plot that basically begins at about 62 degrees and goes  
9 to 67 degrees --

10 Q. Right.

11 A. -- which is a couple of degrees Centigrade.

12 Q. Sure.

13 A. And so the thing that looks like they're wide swings as  
14 plotted this way --

15 Q. Uh-huh.

16 A. -- are an optical kind of a thing.

17 Q. I got it.

18 A. You've got it?

19 Q. A couple of degrees Centigrade is really important when  
20 it comes to stream temperature, isn't it?

21 A. This is an optical kind of effect, and we're talking  
22 about small temperature differences --

23 Q. 2 degrees.

24 A. -- a little warmer, a little colder.

25 Q. 2 degrees C, right?



## Menzie - Recross

1 A. In the air.

2 Q. Okay. But also in the water. If you look at the other  
3 exhibit, the median temperature from the Stillhouse exhibit,  
4 you see in 2008 and '09 the temperature is about 20.5. And  
5 then just as you would expect, it goes up about 2 degrees,  
6 sort of mirroring the --

7 A. I can see from this, it was coming down in this  
8 temperature graph from '10 to '11 to '12, but it's remaining  
9 kind of constant in Stillhouse. I know that there are things  
10 going on in Stillhouse Mine during this period of time as  
11 they're shutting down and closing out around 2012. So that's  
12 why I don't think we can take these things and say we  
13 understand what's going on from this relationship.

14 Q. But this is going up from '10 to '11 and then down in  
15 '12, just like the air temperature.

16 A. No, it's staying pretty constant. It's from '11 to '12,  
17 as far as I can tell.

18 Q. Because from 23 to 22, you know, seven, something like  
19 that?

20 A. This is another truncated graph which is created to kind  
21 of make it look large.

22 Q. Forget the graphs. Let's just talk about the numbers.

23 A. Seriously, this is an optical thing that's created.

24 Q. I understand what you're saying, and I'm not -- we don't  
25 want to focus on the optics. Let's focus on the numbers. It

Menzie - Recross

1 goes down. The numbers go down. They go up about from 22,  
2 you know, 25 to 23, from 2010 to 2011, right?

3 A. Well, let's look at --

4 MR. MCLUSKY: Your Honor, this is argument. These  
5 graphs show what they show.

6 MR. LOVETT: Fair enough. That's all I have. Thank  
7 you.

8 THE COURT: All right. Any other questions?

9 MR. MCLUSKY: No, Your Honor.

10 THE COURT: All right. Doctor, you may step  
11 down.

12 THE WITNESS: Thank you.

13 THE COURT: All right. Mr. McLusky?

14 MR. MCLUSKY: I have no further questions.

15 THE COURT: All right. Any further witnesses?

16 MR. MCLUSKY: Oh, no. I'm sorry. We rest.

17 THE COURT: All right. The defendant rests. Do the  
18 plaintiffs have rebuttal evidence?

19 MR. BECHER: Yes, Your Honor. Plaintiffs would  
20 first call Karen Prestegaard.

21 THE COURT: All right.

22 MR. HARVEY: Your Honor, we already know what  
23 Dr. Prestegaard has testified to in her expert report and in  
24 her deposition. It doesn't rebut any evidence that we've put  
25 on in this case. I'm not sure why she's being called.

1 MR. BECHER: Dr. Prestegaard was asked to do an  
2 analysis of the substance on the rocks. There was a lot of  
3 testimony and a lot of focus on the report on the importance  
4 of embeddedness at these sites, and we want to make the  
5 showing with Dr. Prestegaard that her chemical analysis shows  
6 that the material on the bottom of the streams is related to  
7 the ionic material that's in the water. It's precipitating  
8 out of the water on the rocks.

9 THE COURT: All right. Go ahead.

10 MR. HARVEY: Your Honor, if I may --

11 THE COURT: Go ahead.

12 MR. HARVEY: -- she renders an opinion that the  
13 water -- or the material on the rocks is calcium and manganese  
14 and that it came from the outlet at the mine. That's the same  
15 thing that Dr. Menzie said. We have no disagreement on this  
16 point.

17 THE COURT: It does seem that the only evidence I've  
18 heard was evidence from the observations of several of the  
19 witnesses and in Exhibit 81 that says that it's manganese.

20 MR. BECHER: There was evidence of manganese. She's  
21 going to present evidence that it was also calcium sulfates  
22 and bicarbonates.

23 THE COURT: All right. I'm going to allow it.

24 Doctor, if you'll step up here, the clerk will swear you  
25 in.

Prestegaard - Direct

1 KAREN PRESTEGAARD, PLAINTIFFS' WITNESS, SWORN

2 DIRECT EXAMINATION

3 BY MR. BECHER:

4 Q. Good morning, Dr. Prestegaard.

5 A. Good morning.

6 Q. If you could, there's a number of notebooks. I'm going  
7 to refer pretty much solely to the first joint exhibit  
8 notebook, which is labeled Joint Exhibits 1 through 58,  
9 appendix D. I think it may be the notebook --

10 A. Okay. Can you tell me what tab?

11 Q. Absolutely. If you could turn to tab 34, which is Joint  
12 Exhibit 34.

13 A. Okay.

14 Q. Do you recognize this document?

15 A. Yeah. It looks like a short form of my CV.

16 Q. Okay. And is this accurate? Does this accurately  
17 reflect your experience?

18 A. Yes.

19 Q. Okay. How are you currently employed?

20 A. I'm an associate professor at the University of Maryland,  
21 College Park.

22 Q. Okay. What department are you in?

23 A. Department of Geology.

24 Q. And what is your area or research of -- or area of  
25 research or focus in the Department of Geology?

Prestegaard - Direct

1 A. I'm a geomorphologist, a hydrologist, and a hydro-  
2 geochemist.

3 Q. Okay. Do you have a lab?

4 A. Yes.

5 Q. Do you have graduate students working in that lab?

6 A. I hope they're working there today. Yes.

7 Q. How many grad students do you have?

8 A. Right now I have four.

9 Q. Okay. Are any of them focusing on hydrogeochemistry?

10 A. Yes. We're looking at trace element deposition and  
11 manganese and iron oxides in tributary streams and other  
12 hydrologic problems.

13 Q. Is that work done under your supervision as head of the  
14 lab?

15 A. Yes.

16 Q. That relies on your expertise in that area?

17 A. Yes.

18 Q. Do you teach any courses involving geochemistry?

19 A. I teach hydrology, watershed hydrology, and for about 30  
20 years I taught groundwater hydrology, which I just passed on  
21 to a junior faculty member. Both of those have significant  
22 sections where I teach about surface water and groundwater  
23 geochemistry.

24 Q. Have you published in this area of geochemistry?

25 A. Yes.

Prestegaard - Direct

1 Q. About how many papers?

2 A. It depends upon how you count them. I've done some work  
3 on volcanic eruptions, which includes some chemical analyses  
4 of rocks, and then more estuarine chemistry. I think a  
5 combination might be about eight or ten papers, somewhere in  
6 there.

7 Q. Have you served as an editor or reviewer on any journals  
8 that deal with geology and geochemistry?

9 A. Absolutely, yeah.

10 Q. Can you give us an example of a couple?

11 A. *Water Resources Research*, which covers those topics.  
12 *Geology*, *GSA Bulletin* are science reviews.

13 Q. Okay. And can you tell us of any appointments you hold  
14 in the geosciences.

15 A. I've been on executive committees for the American  
16 Geophysical Union. I was chair of the Erosion Sedimentation  
17 Committee. I was on the Water Quality Committee. I was  
18 secretary in the hydrology section for the Geological Society  
19 of America. I was on GSA council. I was chairperson of the  
20 geomorphology division.

21 Let's see what else. I've been on National Academy of  
22 Sciences committees. I was on the advisory committee for  
23 earth sciences for the National Science Foundation. Is that  
24 enough?

25 Q. I believe so.

Prestegaard - Direct

1 MR. BECHER: I would at this point move to qualify  
2 Dr. Prestegaard as an expert in geology with specific  
3 expertise in geochemistry.

4 THE COURT: All right. I find that she has  
5 sufficient expertise to qualify. The defendant can  
6 cross-examine her as to her qualifications.

7 BY MR. BECHER:

8 Q. Dr. Prestegaard, can you describe what you were asked to  
9 do for this case?

10 A. I was just asked to look at the coatings on rocks that  
11 were collected from Stillhouse Creek.

12 Q. Okay. And how did you go about doing that work?

13 A. Well, I also reviewed the report that Menzie had done  
14 where he analyzed the coatings on the rocks by x-ray, x-ray  
15 fluorescence analysis, and so I opted to do them by the same  
16 way, the same technique.

17 Q. Okay. And can you explain a little bit the procedures  
18 used to determine what was in the surface coatings of these  
19 rocks?

20 A. Yes. I received specimens of rocks collected from  
21 Stillhouse Creek. The sites were upstream of the haul road,  
22 which would be similar to the sites where I think Chris Swan  
23 did his analysis.

24 Three -- two sets of three samples were collected. One  
25 was downstream of the spillway, and the other site was 20 feet

Prestegaard - Direct

1 downstream of that, and there were three rocks collected in  
2 each of those two sites.

3 I got the rocks. I think they were wrapped in paper  
4 and -- I don't know if they were put in plastic bags, ziplock  
5 bags. So I allowed the rocks to dry, broke them in half and  
6 then examined them.

7 The coatings were -- the surface of the rocks were black.  
8 The interior of the rocks were white and primarily quartz.

9 THE COURT: I'm going to stop you. I don't recall  
10 Dr. Menzie testifying as to his analysis of any coatings or --

11 MR. BECHER: Mr. Menzie initially had in his report  
12 an analysis of the coatings of the rocks, and I believe Dr.  
13 Prestegaard was just telling us part of the reason she chose  
14 her method was based upon that.

15 I'm just setting up to explain what she did, and then  
16 next I'm going to ask her what she found.

17 THE COURT: I still don't quite understand what it  
18 is that this is rebutting that was presented in the  
19 defendant's case. Dr. Menzie didn't testify as to any of the  
20 substances.

21 As I understand it, he adopted the -- or at least  
22 acquiesced to the observation of the DEP personnel that  
23 generated Exhibit 81 that it seemed to be manganese sediment  
24 on there, but I don't recall that there was any testimony from  
25 the defendant about anything else regarding the presence or



Prestegaard - Direct

1 absence of manganese or other chemicals or substances in the  
2 water.

3 MR. BECHER: Again, this is to refer to the argument  
4 about embeddedness as being important. We want to make the --  
5 to the extent that they have argued embeddedness is what's  
6 causing impairment, we want to show that is directly related  
7 to the ionic composition of the water, the same composition  
8 that's causing stress to the organisms.

9 MR. HARVEY: Your Honor, we put on evidence  
10 ourselves that the embeddedness was due to the same things  
11 they're talking about.

12 Let me cut to the chase. What they want to show is that  
13 the embeddedness is somehow related to conductivity. If you  
14 look at Miss Prestegaard's report -- Dr. Prestegaard's report,  
15 it doesn't mention the word "conductivity." In her deposition  
16 she doesn't talk about conductivity.

17 That's what this is about. It's going to lead to  
18 nowhere.

19 THE COURT: Well, go ahead.

20 MR. BECHER: And let me speed this up, Your Honor.

21 BY MR. BECHER:

22 Q. Did you find any materials related to ions in the water  
23 column other than manganese that were important on these rock  
24 coatings?

25 A. All right. So I compared the composition of the rock

Prestegaard - Direct

1 coatings to the interiors, took the ratios of all those  
2 elements, and two of them came out as being high. One was  
3 manganese, as has been discussed. Manganese is about 15 times  
4 higher in the coatings than in the rock interiors.

5 The other one is calcium. Calcium is about five times  
6 higher in the coating than the rock interiors. And realize  
7 those are minimum amounts that's higher. So we trimmed off  
8 the coatings, and you always get a little bit of the interior  
9 of the rock with that.

10 So that suggests that there's two things at least on this  
11 rock. One is some calcium-bearing mineral, which could be  
12 calcium sulfate or calcium carbonate. Calcium sulfate or  
13 calcium carbonate precipitation inorganically on a rock  
14 requires that the concentrations in the water column be  
15 essentially saturated with respect to those minerals, such as  
16 aragonites.

17 So if we're getting calcium carbonate deposition on the  
18 rock, you have to have high concentrations of calcium and  
19 bicarbonate for that to happen. Or it could be calcium  
20 sulfate, and the concentrations of that would be even higher  
21 because calcium sulfate is so much more soluble than calcium  
22 carbonate.

23 Q. So your opinion is what you found on these rocks, in  
24 addition to the manganese, was the presence of calcium which  
25 was combined with either sulfates or bicarbonates.

Prestegaard - Direct

1 A. Yes.

2 Q. And can you turn briefly to figure 30 -- or Joint Exhibit  
3 38.

4 A. Yes.

5 Q. And these are the ratios you derived for the different  
6 elements that support your testimony here?

7 A. Yes.

8 Q. Okay. And specifically the calcium -- I take it the  
9 ratio of 1 would be an equal ratio.

10 A. In interiors and in coatings, calcium is 5.75 times  
11 higher in the coatings than in the interiors. And that's a  
12 minimum, like I said, because it's of the contamination.

13 Q. Turning to the next joint exhibit, 39, this graphically  
14 represents those same data.

15 A. Yes.

16 Q. And support the same opinion that this is --

17 A. That calcium is elevated in the coatings relative to the  
18 rocks.

19 Q. There was an issue about a reference site that came up in  
20 deposition. You did not use any rocks from a reference site.

21 A. I was also given some other rocks. Since I didn't  
22 collect these rocks, I wasn't able to select a site that was  
23 geologically similar, similar in size, etcetera. And when I  
24 got the rocks, they were of a different composition, and one  
25 of the rocks was actually a piece of slag, which told me that

Prestegaard - Direct/Cross

1 there was mining or something going on, and I didn't think  
2 that was a proper reference stream.

3 Q. So rather than use the reference stream as a comparison,  
4 you decided --

5 A. I compared the rock to -- the coatings to the interior.

6 Q. And would that be because it would be the interior of the  
7 rock --

8 A. Well, if a rock is sitting in a stream, a couple of  
9 things could happen. It actually can continue to weather.  
10 And that means in a stream that's relatively dilute, you might  
11 leach calcium out of that rock rather than put it onto the  
12 surface. In fact, leaching of calcium on the rocks is a major  
13 source of the calcium bicarbonate that's in most stream waters  
14 that are relatively pristine.

15 So the fact that you've got calcium with some other anion  
16 actually deposited on the rock means you've got concentrations  
17 in excess of that required to cause precipitation.

18 MR. BECHER: That's all I have, Your Honor.

19 THE COURT: All right. Cross?

20 MR. HARVEY: Briefly, Your Honor.

21 CROSS EXAMINATION

22 BY MR. HARVEY:

23 Q. So as I understand it, Dr. Prestegaard, there was more of  
24 a certain substance on the outside of the rocks than the  
25 inside of the rocks; is that correct?

Prestegaard - Cross

1 A. Yes.

2 Q. Including calcium?

3 A. Calcium, yeah.

4 Q. And manganese?

5 A. Calcium and manganese were the only -- were the two that  
6 were most significantly higher.

7 Q. And because there was more on the outside than the  
8 inside, you concluded that must have been a result of mining,  
9 correct?

10 A. I concluded that there had to be a source of calcium; and  
11 since it was a solid face, something had to be deposited  
12 there.

13 Q. And you tried to check that theory against what rocks may  
14 be present in reference streams, and you were going to do the  
15 same analysis --

16 A. Well, a reference stream would have to have the same rock  
17 chemistry and watershed chemistry. So comparing the interior  
18 to the coatings is probably a better reference anyway.

19 Q. I know you don't want to talk about this, but you tried  
20 to do the same analysis from rocks in a reference stream,  
21 didn't you?

22 A. I did not do the analysis on rocks in a reference stream.  
23 I was given rocks from a reference stream, and I did not think  
24 that they were appropriate for analysis.

25 Q. Because those rocks -- some of those rocks were coal

Prestegaard - Cross

1 slag, correct?

2 A. Right, which indicated that it was not a reference kind  
3 of stream, and the rock types were very different.

4 Q. Who collected those rocks for you, Dr. Prestegaard?

5 A. I don't recall. Somebody might -- could recall the name  
6 of --

7 Q. If it was -- it was Mr. Becher that collected those,  
8 correct?

9 A. I believe it was, yes.

10 Q. And you told me at your deposition that it would have  
11 been helpful to analyze rocks in a reference stream, didn't  
12 you?

13 A. I did, yes, if they had the appropriate, well, geology  
14 and reference conditions.

15 Q. Sure. You couldn't do that because you were given coal  
16 slag, correct?

17 A. As one of the things, yeah.

18 Q. Who collected the rocks for you at the Stillhouse site?

19 A. I think Mike asked somebody to collect those rocks for  
20 me.

21 Q. How do you think it would be that someone would pick up a  
22 piece of coal slag from a reference stream and give it to you  
23 as a representative sample?

24 A. Because rocks that sit in streams for a while end up  
25 having stuff on the surface, whether it's algae or something

Prestegaard - Cross

1 else, and so it's hard to actually see what the rocks look  
2 like. It's not until you break them open that you would  
3 actually really know what they're like.

4 Q. Okay. Is it possible someone was trying to give you the  
5 worst example of a black rock to use as a --

6 A. I think -- well, since that was the reference stream, I  
7 think they were trying to pick up basically black rocks to  
8 compare with -- or dark rocks to compare with dark rocks from  
9 the Stillhouse.

10 Q. The rocks that you examined came from the area that  
11 Dr. Swan sampled, correct?

12 A. Yes. I was told that they were collected upstream of the  
13 haul road, downstream of the spillway. In fact, they were  
14 described as being just downstream of the spillway and then  
15 20 feet downstream of that.

16 Q. Okay. And you've been here through the entire trial,  
17 haven't you?

18 A. I have.

19 Q. And you heard testimony that the high embeddedness was at  
20 the lower level, lower reaches --

21 A. Downstream of the haul road, yes.

22 MR. HARVEY: Okay. One moment, Your Honor.

23 THE COURT: Go ahead.

24 BY MR. HARVEY:

25 Q. You're a hydrogeologist, correct, Dr. Prestegaard?

Prestegaard - Cross

1 A. I'm a geomorphologist, hydrologist, hydrogeochemist,  
2 yeah.

3 Q. Do you think the flows are modified in the stream because  
4 of the pond and the flume?

5 MR. BECHER: Objection, Your Honor. This is outside  
6 her report and outside the direct.

7 THE COURT: Sustained.

8 MR. HARVEY: I thought I'd try, Your Honor. Thank  
9 you.

10 MR. BECHER: No questions, Your Honor.

11 THE COURT: All right. Doctor, you may step down.  
12 Thank you.

13 All right. Does the plaintiff have any other rebuttal  
14 evidence?

15 MR. BECHER: We do, Your Honor. Could I request  
16 about a five-minute break?

17 THE COURT: All right. We'll take a brief recess.

18 (Recess from 11:20 a.m. to 11:28 a.m.)

19 MR. LOVETT: Plaintiffs are ready, Your Honor.

20 THE COURT: All right. Call your next witness.

21 MR. LOVETT: Dr. Margaret Palmer.

22 THE COURT: All right. Dr. Palmer, if you'll step  
23 up here. You've already been sworn. You're still under oath.

24 MARGARET PALMER, PLAINTIFFS' WITNESS, PREVIOUSLY SWORN

25 DIRECT EXAMINATION



Palmer - Direct

1 BY MR. LOVETT:

2 Q. Good morning, Dr. Palmer. Did you hear Dr. Menzie's  
3 testimony yesterday and today?

4 A. I did.

5 Q. Okay. You heard him testify that he was on the review  
6 panel for the benchmark?

7 A. Yes.

8 Q. And that he did not recognize the nature of the DEP data  
9 that the benchmark was based on?

10 A. I did.

11 Q. Now, have you been a reviewer of many papers over your  
12 career?

13 A. I have.

14 Q. Would you expect any competent ecological reviewer to  
15 understand that dataset upon reviewing the benchmark?

16 A. Well, certainly anybody that works on streams, an  
17 ecologist understands very well how states do their routine  
18 assessments. All the states are required to do such  
19 assessments to comply with determining which streams should be  
20 on the 303(d) list.

21 For example, in the State of Maryland, the database is  
22 called the Maryland Biological, NBSS, Stream Survey, and it's  
23 collected very similarly to how they do it in West Virginia.  
24 And that database has been used extensively by scientists in  
25 peer-reviewed articles.

Palmer - Direct

1 Q. Okay. Did you hear Dr. Menzie testify that the  
2 temperature range between 19 and 21 is a -- well, what did  
3 Dr. Menzie say the range of 19 to 21 was?

4 A. I believe he called that their thermal preferences for  
5 organisms.

6 Q. And he derived the thermal preferences, I think he said,  
7 from two lines of evidence; is that right?

8 A. That's my understanding.

9 Q. Okay. And the first line -- or one line of evidence,  
10 would you turn to -- I should've had it for you. I'm sorry.  
11 It's the joint exhibit book, number -- starting at Joint  
12 Exhibit 58. Is that up there?

13 A. Yes, it is.

14 Q. Would you turn to tab 75, please. I'm sorry. It's tab  
15 78.

16 A. I thought you said 58.

17 Q. Joint Exhibit 78, Joint Exhibit page 562.

18 THE COURT: You're in book 2.

19 MR. LOVETT: Book 2.

20 MR. BECHER: Your Honor, we have the situation as  
21 last time. Dr. Palmer has some problems with the books.

22 THE COURT: Yes. You may help.

23 MR. LOVETT: Well, let me ask Dr. Palmer -- I'm only  
24 going to use a couple of books this time.

25 Do you need Mike to --

Palmer - Direct

1 THE WITNESS: I think right now I'm okay. I'm on  
2 the right page. If I don't have to lift them all --

3 MR. LOVETT: It won't be many. It won't be like  
4 yesterday with all the books.

5 THE WITNESS: Okay.

6 BY MR. LOVETT:

7 Q. Have you seen this table before?

8 A. Yes, I have.

9 Q. Was it part of Dr. Menzie's expert report?

10 A. Yes, it was.

11 Q. And he testified yesterday that this was one of the two  
12 lines of evidence --

13 MR. MCLUSKY: Your Honor, we didn't put in this  
14 evidence. We're asking questions about this, so we're  
15 rebutting something that never was asked about.

16 MR. LOVETT: That's --

17 THE COURT: Go ahead. What's this --

18 MR. LOVETT: Yes. Dr. Menzie said he used two lines  
19 of evidence yesterday to derive his temperature data. One was  
20 the databases that he used, and the other were review of the  
21 literature. And this is the review of the literature that he  
22 performed. It is a joint exhibit. It was in his report, and  
23 it is the review of literature that he testified that he  
24 performed yesterday.

25 MR. MCLUSKY: That may all be true, but it's not in

Palmer - Direct

1 evidence. There were no questions by Mr. Lovett of Dr. Menzie  
2 of what literature he relied on, and it can't come in this  
3 way.

4 MR. LOVETT: There was. He said yesterday in direct  
5 that he relied upon --

6 THE COURT: Address the Court, not each other.

7 MR. LOVETT: I'm sorry. That he relied upon -- that  
8 he relied upon the published literature and the DEP database  
9 and the Stillhouse data --

10 THE COURT: You're talking about the published  
11 literature with respect to how different species are  
12 characterized as between being tolerant and intolerant?

13 MR. LOVETT: Yes. And that is what this table  
14 represents.

15 THE COURT: I'm going to allow it. Go ahead.

16 MR. LOVETT: Thank you.

17 BY MR. LOVETT:

18 Q. Now, do you see -- would you explain generally how this  
19 table works?

20 A. Sure. So what he has listed here is several sensitive  
21 species, 20 sensitive taxa, genera; and he is providing  
22 literature sources in the far right-hand column to support how  
23 he identified a temperature preference for that particular  
24 genera.

25 At the end of that table are the titles and citations

Palmer - Direct

1 that go with each of the source numbers in that table.

2 MR. LOVETT: May I approach?

3 THE COURT: You may. What page are you on, again?

4 I'm sorry.

5 THE WITNESS: JE 962 through 964.

6 BY MR. LOVETT:

7 Q. Is this paper one of those references?

8 A. It is.

9 Q. Which one is it?

10 A. This is the one by -- one of the ones by Angradi, and  
11 this is the one that was published in 1997 by Ted Angradi  
12 called "Hydrologic context" and so forth.

13 Q. So it's reference 2, right?

14 A. That's correct.

15 Q. And if you look down his table, there's several uses of  
16 reference 2, right?

17 A. That's correct.

18 Q. Okay. Now, he reports I think temperature of the field  
19 site as a range of zero to 18 degrees C. Do you see that?

20 A. I do.

21 Q. And does this study support that?

22 A. Well, I mean it's like several of the other ones. It's a  
23 little odd citation for that because the study is about  
24 response to floods, not the response to temperature.

25 Q. Uh-huh.

Palmer - Direct

1 A. In the paper, like most papers, they'll just report what  
2 the temperature was at the study sites where they worked, and  
3 that's what's basically done here. It's also like several of  
4 the papers from the Fernow Experimental Forest.

5 Q. Where is that?

6 A. It's in the very northern part of the State of West  
7 Virginia. It's a relatively high elevation area.

8 Q. Near Parsons?

9 A. Yeah.

10 Q. Okay. So that's a much different climate from the one we  
11 have --

12 A. Yeah. I think my recollection is that the elevation is  
13 about 1700 to over 3000 feet, and I believe Clay County is  
14 about, I don't know, maybe a thousand or something. So it's a  
15 lot cooler.

16 Q. Anything about this study that would lead you or anybody,  
17 any careful reader, to conclude that it was trying to  
18 establish a temperature range for aquatic insects?

19 A. It absolutely would not.

20 Q. And can you tell us which reference this is?

21 A. This is the other reference by Ted Angradi, and this one  
22 is 1996.

23 Q. So it would be reference 1?

24 A. Reference 1, that's correct.

25 Q. Okay. And what does Dr. -- what use does Dr. Menzie make

Palmer - Direct

1 of this?

2 A. Well, again, he uses it to identify some temperature  
3 preferences, and the -- this is just a comparison of three  
4 different streams, again in the Fernow Experimental Forest.  
5 One is called Canoe Run, one is Stonelick Run, one is Wilson  
6 Hollow, and it simply reports the mean temperature at those  
7 three sites.

8 Q. Just reports the mean.

9 A. That's correct. It tests some species distributions at  
10 the three sites, but it doesn't talk about temperature  
11 preferences or -- you know, I'm not sure why he chose it.

12 Q. Do you believe it would be inappropriate to use this to  
13 help determine the temperature preference of aquatic insects?

14 A. Well, I don't know if it is inappropriate, but it's not  
15 very informative.

16 Q. And which is this one?

17 A. This is the one by Michael Griffith, 1993, reference 3.

18 Q. So it's reference 3.

19 A. Yes.

20 Q. Okay. And --

21 A. Oh, wait. Wait. No. It's reference 4. I'm sorry.

22 Q. You're right. It is reference 4. And is this also in  
23 the Fernow Experimental Forest?

24 A. It is.

25 Q. And what is it designed to show?

Palmer - Direct

1 A. Well, it was designed to look at the response of  
2 macroinvertebrates to acid precipitation. So it was really  
3 comparing places that differed in terms of pH.

4 Q. Are temperatures even reported in there?

5 A. They may be. I don't recall. I'd have to look again,  
6 but temperature is not the focus of the paper.

7 Q. Which -- this is a response of chironomid species. Which  
8 reference is this?

9 A. This is reference number 5.

10 Q. Okay.

11 A. And it's, again, responses of chironomids to water  
12 temperatures. So, you know, at least it is focused on  
13 temperature.

14 Q. Uh-huh. And what do you -- why do you think it was  
15 inappropriate for him to have put this to the purpose he did?

16 A. Well, the vast majority --

17 MR. MCLUSKY: Your Honor, I'm going to object to  
18 this. I'm looking at her rebuttal report, and she mentions  
19 two journals in particular. She discusses them, but she  
20 doesn't go in any detail and discuss this journal at all in  
21 her rebuttal report.

22 THE COURT: She mentions two of the journals that  
23 are listed in --

24 MR. MCLUSKY: Right.

25 THE COURT: -- page 964? Is that right?



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1 MR. MCLUSKY: She references -- in her rebuttal  
2 report, she just generally says -- she references Griffith,  
3 who we just went through --

4 THE WITNESS: Let me read it.

5 THE COURT: Well, I'm going to deny your objection.  
6 If she specifically noted in her rebuttal report that she was  
7 going to criticize the literature that Dr. Menzie relied upon  
8 in determining these tolerance ranges and she listed two of  
9 them, the others are before us, so --

10 MR. MCLUSKY: Again, it's literature he never even  
11 testified to about here. There's no testimony this is the  
12 literature --

13 THE COURT: Well, I agree that if it was -- and I  
14 want to make sure I understand. It was his testimony that he  
15 relied upon literature in determining the range of  
16 temperatures by which these certain species seem to thrive or  
17 not, and he testified at length about that as the basis for  
18 his opinion. So I think it's fair game for the plaintiffs --

19 MR. MCLUSKY: Well, there's no testimony about what  
20 literature he relied on. There was no question about that by  
21 Mr. Lovett.

22 THE COURT: Well, it seems apparent from the exhibit  
23 that he prepared that hasn't been introduced into evidence but  
24 it's now referred to that is his exhibit, that this is the  
25 literature. If that's not the case --

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1 MR. MCLUSKY: It's a report he prepared. It's just  
2 never been introduced into evidence. There's no testimony  
3 about it.

4 THE COURT: Well, that's okay because he testified  
5 yesterday that he relied upon literature on this particular  
6 point of his opinion. So this is fair game.

7 MR. LOVETT: And we're almost finished, Your Honor.

8 BY MR. LOVETT:

9 Q. We were on reference 5, the -- and you were about to tell  
10 us why this was inappropriate to use for the purposes of  
11 determining temperature ranges in West Virginia.

12 A. Well, I just thought it was a little odd because the vast  
13 majority of the data points, thousands of them, are from  
14 Italy.

15 Q. From Italy?

16 A. Italy. And then I think there's some from maybe Germany,  
17 France, Algeria, a few places, but nothing from the ecoregion  
18 that we're talking about.

19 Q. Anything in here that could help you form an opinion  
20 about the temperature ranges of aquatic insects in the area in  
21 question here?

22 A. No, it did not.

23 Q. Lastly, this is a paper called "Influences of land use on  
24 leaf breakdown in southern Appalachian headwater streams."

25 Which reference is that?

Palmer - Direct

1 A. That is reference 6 by Sponseller and Fred Benfield.

2 Q. And what does this study focus on?

3 A. This is a study focused on what controls the rate of  
4 deposition of litter in streams.

5 Q. And what was the conclusion of the paper?

6 A. Well, they looked -- did look at the effect of  
7 temperature on litter decomposition, as well as the abundance  
8 of shredders who were in the litter, leaf litter. They found  
9 temperature didn't affect litter decomposition. It sort of  
10 surprised me. But they did not look at the relationship  
11 between temperature and species preferences or anything of  
12 that nature.

13 Q. So none of those papers addressed the issue of whether --  
14 in your professional opinion, addressed the issue of the  
15 expected ranges of aquatic insects in Southern West Virginia.

16 A. The -- in West Virginia, no. The papers you've shown me  
17 didn't. There was one paper he used that did have some  
18 temperature preferences, his last one, but --

19 Q. Well, would that be sufficient for him to form all the  
20 opinions that he formed regarding the range of aquatic insects  
21 from the literature?

22 A. No. In fact, my recollection was that that paper only  
23 included maybe information on eight of the taxa that they  
24 looked at, and he picked the ranges in there. He ignored the  
25 maximum temperatures that are reported in there at which they

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1 occur.

2 Q. Okay. Now, the other line of evidence, as I understand  
3 it, that Dr. Menzie used was his reliance upon the DEP  
4 database and the Stillhouse literature; is that right?

5 A. That's correct. Those two lines of evidence, my  
6 understanding was, helped him identify the preference range.

7 Q. Okay. So do you recall what years he testified the  
8 Stillhouse data were from?

9 A. Well, yes. I paid a lot of attention to that because we  
10 had spent a lot of time trying to replicate his results with  
11 the data he sent us, and we were unable to do that.

12 So what I heard him say, I'm pretty sure, was that the  
13 data from the DEP database he used to establish temperature  
14 preferences was 1997 through 2008.

15 Q. Okay.

16 MR. MCLUSKY: Well, Your Honor, none of this is in  
17 the report, none; no discussion of the range of temperature  
18 data. They've had this data since March of 2014, and none of  
19 this is referenced in her report.

20 MR. LOVETT: I do not believe we've had this data  
21 since March. I think we got it in June.

22 THE COURT: Well, first, was this disclosed in her  
23 rebuttal report?

24 MR. LOVETT: Her disagreement with his assessments  
25 of temperature was disclosed in the rebuttal report. The

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1 specific testimony as elicited from his testimony here today  
2 was not included in the rebuttal report because he did not  
3 express the opinion in a way that would have elicited this  
4 response.

5 THE COURT: Summarize for me what this second prong  
6 or --

7 MR. LOVETT: The only prong is going to be, is it  
8 appropriate to compare temperature data from Stillhouse from  
9 2007 to 2013 to temperature data from 1997 through 2008.

10 MR. MCLUSKY: This should have been in the rebuttal  
11 report. It's unfair to us to reveal this at the last moment.  
12 They've had these data since March, Your Honor. They had  
13 every opportunity put it in the rebuttal report so we could  
14 deal with it. They've not done that.

15 THE COURT: Well, did Dr. Menzie's report reveal the  
16 dates that he used from these different data sources?

17 MR. MCLUSKY: I don't remember, Your Honor, but we  
18 gave them the data and he was deposed. So every opportunity  
19 to figure all that out was there. I think he was deposed  
20 after those data --

21 THE COURT: Well, this is difficult for the Court to  
22 sort out, not having seen all these reports or exhibits.  
23 Clearly this was his testimony. I'm going to allow this as  
24 rebuttal of his testimony.

25 MR. LOVETT: Thank you.

Palmer - Direct

1 BY MR. LOVETT:

2 Q. Is it appropriate -- okay. So, and do you know what  
3 years the Stillhouse data were from?

4 A. From his testimony I know. None of this was in his  
5 report. So I had assumed he used the whole dataset. He said  
6 2008 through 2013 was Stillhouse.

7 Q. And he had two samples from each month from 2008 to early  
8 2013, correct?

9 A. I think that's what he said in testimony.

10 Q. Okay.

11 THE COURT: Would you clarify something. You said  
12 that two thousand -- the years of the database that he used  
13 only came up to 2008. Does the database go beyond that?

14 THE WITNESS: I think it goes on up through at least  
15 2010 is my understanding, but I'd have to verify that.

16 MR. LOVETT: Dr. King will know the answer to that,  
17 Your Honor.

18 BY MR. LOVETT:

19 Q. So the WVDEP database is snapshots, as he described,  
20 correct?

21 A. That's correct.

22 Q. And the Stillhouse is bimonthly sampling, right?

23 A. Yes.

24 Q. And they're from completely different time periods,  
25 right?

Palmer - Direct

1 A. They are. They don't -- they don't really overlap.

2 Q. And is it appropriate -- was it appropriate for him to  
3 draw the conclusions that he drew from that?

4 A. No. If you're going to try and use -- set up preferences  
5 and then identify what the temperature was during the time  
6 period -- excuse me -- what the preferences were over a  
7 particular time period and then compare that to the  
8 temperatures in Stillhouse at a different time period, it  
9 doesn't really make sense because we know there's a lot of  
10 year-to-year variability in temperature.

11 Q. And Joint Exhibit Book 2, 58 onward, at tab 73.

12 A. Is it this one? Okay.

13 Q. Do you see that at JE page 957?

14 A. I do.

15 Q. Did that figure convince you that there is a difference  
16 between tolerant and intolerant or -- yeah, intolerant taxa  
17 regarding temperature?

18 A. Well, I would never just rely on making a visual  
19 assessment of a data plot. So, no, it did not.

20 Q. What should he have done?

21 A. He should have done some sort of statistical analysis to  
22 compare those distributions.

23 Q. If you were a journal editor and somebody submitted this  
24 to you, what would you say about it?

25 A. Well, you would never accept a paper that didn't show

Palmer - Direct

1 there was a statistically significant difference.

2 Q. Would that have been easy to do, I mean the analysis?

3 Would it have been easy to perform?

4 A. I would assume so.

5 Q. Okay. Well, can you perform such an analysis?

6 A. Yeah. We could have looked at the distributions and  
7 compared them.

8 Q. Okay. On tab 75, JE 959, you've seen this before, right?

9 A. Yes.

10 Q. Now, what do you think that the exclusion of the  
11 suboptimal data do to that table?

12 A. Well, I think it's inappropriate for a couple of reasons.  
13 One, at least our assessment was that suboptimal was the  
14 relevant habitat for Stillhouse; but perhaps more importantly,  
15 there was so many data points within the suboptimal range and  
16 by eliminating those data points dramatically reduced the  
17 sample sizes.

18 Q. And did you hear Dr. Menzie testify at the end of his  
19 testimony today that if he changed the data points and -- by  
20 adjusting the RBP score to 130, that he did not think that  
21 would significantly change the box plot?

22 A. Yes, I did hear that.

23 Q. And what do you think of that testimony?

24 A. Well, we actually did, using the data he sent us, look at  
25 the relationship between WVSCI and conductivity within each of



Palmer - Direct

1 the categories of suboptimal, marginal, optimal. And the  
2 relationship was significant within each of those categories.

3 Q. And you know, don't you, that suboptimal habitat does not  
4 lead to, alone, does not lead to WVSCI impairment, does it?

5 A. It would not.

6 Q. What do you base that opinion on?

7 A. Well, I should say -- yeah, impairment. You're right.  
8 Impairment. The loss of the number of genera that we see in  
9 these streams is really dramatic. And, you know, for the most  
10 part, based on the work I've done over the last 20-plus, 25-  
11 plus years, the only time we see that level of extirpation  
12 typically is when there's a major pollutant of some sort.

13 Q. Do you agree with Dr. Menzie that RBP isn't necessarily a  
14 good predictor of the stream health?

15 A. Yeah, I agree.

16 Q. And do you think that habitat is generally a good  
17 predictor of the invertebrate community?

18 A. No. I mean habitat is important, but as I testified a  
19 few days ago, rarely is habitat the most limiting factor. And  
20 I've done -- I've published numerous papers actually in the  
21 last five years because of my work on stream restoration  
22 demonstrating that when you restore habitat, it doesn't lead  
23 to recovery of biodiversity. And that's in streams throughout  
24 the U. S. I've got multiple, many, many, many studies.

25 Q. Why doesn't it? What's the problem?

Palmer - Direct

1 A. It's just that's not the most limiting factor. If you  
2 don't take care of the problems that are causing loss of  
3 species locally, it doesn't matter how good the habitat is.  
4 Habitat becomes important when other things aren't more  
5 important, basically.

6 Q. Now, in terms of temperature, did you hear Dr. Menzie  
7 testify that he used 30 sensitive and 20 tolerant taxa?

8 A. I did.

9 Q. About how many taxa are there in the streams?

10 A. I think in the West Virginia database, there's over 500.

11 Q. Five hundred? And so what did excluding those about 470  
12 taxa from his temperature calculations do to -- how did that  
13 harm his conclusion?

14 A. Well, I mean it's hard to predict, but I think basically  
15 you couldn't say whether or not species distributions would  
16 shift based on the analysis that he did because it includes  
17 such a small subset.

18 Q. Because the WVSCI includes the EPT taxa, right?

19 A. It does, yes.

20 Q. And there are a lot more EPT taxa than he's considering,  
21 correct?

22 A. In West Virginia, sure.

23 Q. Okay. Have you conducted many RBPs yourself?

24 A. I have.

25 Q. And do you see embeddedness as a problem very often?

Palmer - Direct

1 A. Yeah. You see it in urban streams, sometimes in urban  
2 streams that are severely impacted.

3 Q. Now, you visited this site you testified earlier, right?

4 A. Yes.

5 Q. I think you said that there was some embeddedness in  
6 certain places but not in others; is that --

7 A. Correct. Absolutely.

8 Q. And you looked at the stream, right?

9 A. Yes.

10 Q. Okay. And so do you understand how it is that --

11 MR. MCLUSKY: Your Honor, this isn't rebuttal.  
12 Dr. Menzie didn't go to this section of the stream. It's a  
13 different section of the stream. She's just repeating what  
14 was testified to earlier.

15 MR. LOVETT: The only follow-up question was going  
16 to try to tie it back to his testimony which asked would it be  
17 reasonable that within the stream, some of it -- some exhibits  
18 embeddedness and not others and that that could explain the  
19 difference in the data sheets.

20 THE COURT: I think Dr. Menzie said that himself.

21 MR. LOVETT: Okay. Sorry.

22 BY MR. LOVETT:

23 Q. Now, you also heard, I think, Dr. Menzie say the Pond  
24 2014 study did not find that conductivity causes impairment.

25 Did you hear that testimony yesterday?

Palmer - Direct

1 A. I'm sorry. Would you say that again? I was distracted.

2 Q. Dr. Menzie testified yesterday that the 2014 Pond study  
3 did not find that conductivity causes impairment?

4 A. He definitely showed conductivity had a big impact, yeah.

5 Q. Okay. Could you -- that's Plaintiffs' Exhibit 19.

6 Now, is this the 2014 Pond study?

7 A. Yes, it is.

8 Q. Would you turn to page 298, PE 298, please?

9 A. Okay.

10 Q. And would you read into the record the sentence at the  
11 top of the page. It's right after the "(figure 6)" where it  
12 says, "Despite federal and state mining regulations."

13 A. "Despite federal and state mining and water quality  
14 regulations intended to safeguard aquatic resources during and  
15 after mining, our data indicated that highly elevated ionic  
16 concentrations may persist for over 30 years post-reclamation  
17 and that these chemical signatures result in damaged aquatic  
18 communities."

19 Q. Go one more sentence, please.

20 A. "Habitat can be a limiting factor, but by design, we  
21 removed significant habitat degradation factors by selecting  
22 sample reaches with relatively good habitat and intact  
23 riparian vegetation at reference and valley fill sites."

24 Q. And then would you turn to the very last paragraph on the  
25 page, beginning "Overall."

Palmer - Direct

1 A. "Overall, biological variation was strongly correlated  
2 with water chemistry and less by reach-scale habitat and  
3 landscape conditions. Since ion concentrations explained the  
4 greatest amount of biological impacts and were the most  
5 altered (compared to reference), this suggests that recovery  
6 is potentially hindered by ions, even in forested reaches long  
7 after reclamation."

8 Q. Okay. Do you agree with -- well, first of all, is this a  
9 peer-reviewed article?

10 A. Yes.

11 Q. Have you read the article?

12 A. I have.

13 Q. Do you find it persuasive?

14 A. Yes. It's the most pervasive because he's actually  
15 controlled for a number of the confounding factors that we've  
16 been discussing.

17 Q. The very things that Menzie says aren't -- or may be  
18 confounding the relationship or causing impairment, right?

19 A. Correct.

20 Q. Okay. Now, you saw the RBP sheets or the metrics from  
21 the RBP sheets that Dr. Menzie testified about this morning,  
22 didn't you?

23 A. I did. I looked at them last night myself.

24 Q. And if the average or median of those is 11 --

25 MR. MCLUSKY: Your Honor, I object. She's now

Palmer - Direct

1     rebutting cross-examination brought by Mr. Lovett about she --  
2     she had access to before. This is a rehabilitation, not a  
3     rebuttal.

4             MR. LOVETT: She had access to it. Dr. Menzie never  
5     testified about those sheets either in his deposition or --

6             MR. MCLUSKY: Right.

7             MR. LOVETT: -- until this case. There's nothing  
8     about them in his report either.

9             MR. MCLUSKY: Right. And he cross-examined him  
10    about them. This is not --

11            MR. LOVETT: I'm just trying to --

12            MR. MCLUSKY: You can't rebut your own cross-  
13    examination.

14            MR. LOVETT: No, I'm not. I'm trying to -- the only  
15    question I'm trying to ask is whether, given those data sheets  
16    which have not appeared until now, she would conclude that the  
17    impairment -- or the RBP scores would lead to impairment.

18            THE COURT: All right. I think that's beyond the  
19    scope of rebuttal.

20            MR. LOVETT: All right.

21    BY MR. LOVETT:

22    Q. I asked Dr. Menzie what the central limit theorem is.  
23    Did you hear that?

24    A. I did.

25    Q. And what is it and why would it have been important for

Palmer - Direct

1 Dr. Menzie to know what it is and to have used it?

2 MR. MCLUSKY: Again, this is not rebuttal, Your  
3 Honor.

4 THE COURT: Well, it may well be rebuttal, but I  
5 don't understand yet.

6 MR. LOVETT: Well, we -- it appears from Dr.  
7 Menzie's testimony that he did not use the methods appropriate  
8 in reaching the conclusions that he reached.

9 I asked him if he used a particular method. He said he  
10 really didn't know what was --

11 THE COURT: What does this method apply to? Is it  
12 some type of statistical model or what?

13 MR. LOVETT: It's a statistical -- it is a  
14 statistical method to understand the data that he presented in  
15 testimony in his case.

16 THE COURT: All right. Did you disclose that  
17 Dr. Palmer was going to be testifying about this proper or  
18 other model or methodology?

19 MR. LOVETT: No, Your Honor, we did not.

20 THE COURT: All right. Then I think it's beyond the  
21 scope, much as I would've liked to have heard about whatever  
22 method this was.

23 MR. LOVETT: One moment, Your Honor. I think I'm  
24 finished. One second.

25 Thank you. That's all I have.

Palmer - Cross

1 THE COURT: All right. Recross?

2 CROSS EXAMINATION

3 BY MR. MCLUSKY:

4 Q. Dr. Palmer, I think you talked a little bit about -- I  
5 think it was Joint Exhibit 75, which was the marginal/poor  
6 habitat compared to the optimal habitat exhibit. Do you  
7 recall that?

8 A. I don't recall.

9 Q. Well, I'm not going to actually refer to the exhibits,  
10 but that's the one with the -- why don't you put it up,  
11 Mr. Tyree?

12 MR. BECHER: I can show her, Bob.

13 BY MR. MCLUSKY:

14 Q. I think you testified that suboptimal habitat alone  
15 doesn't lead to impairment. Is that what you said just a  
16 moment ago? I wrote that down.

17 A. That's correct. It rarely leads to impairment.

18 Q. What is the range of RBP scores for suboptimal habitat?

19 A. Let's see. I know if it goes less than about 120, it's  
20 considered a problem. No. 110 to 140 or something.

21 Q. And Dr. Swan had a 130, if I recall correctly.

22 A. Uh-huh.

23 Q. And you wrote a report I think dated January of this  
24 year; is that correct?

25 I think Mr. Tyree can show you the first page just to



Palmer - Cross/Redirect

1 refresh your recollection.

2 Do you remember this report?

3 A. Sure.

4 Q. Mr. Tyree, would you go to page 8, please, and blow up  
5 the highlighted section there.

6 I'm just going to ask you to read the highlighted section  
7 from your January report.

8 A. "Tetra Tech identified the one point at the RBP score  
9 that would reflect impairment, and this was supported with a  
10 rigorous scientific analysis and explanation. The Stillhouse  
11 score is clearly above this. Furthermore, the siltation" --

12 THE COURT: Slow down.

13 THE WITNESS: "Furthermore, the siltation submetric  
14 within the RBP assessment is recognized as particularly  
15 important and is not a problem in Stillhouse."

16 MR. MCLUSKY: Thank you. That's all I have, Your  
17 Honor.

18 THE COURT: All right. Any other questions?

19 MR. LOVETT: One, Your Honor.

20 REDIRECT EXAMINATION

21 BY MR. LOVETT:

22 Q. Does the passage that -- may I ask it from here?

23 THE COURT: Yes.

24 BY MR. LOVETT:

25 Q. Does the passage that Mr. McLusky had you read change

Palmer - Redirect

1 your testimony in any way?

2 A. Absolutely not. I've looked at thousands of streams and  
3 RBP scores, and rarely is suboptimal habitat enough to cause  
4 impairment.

5 MR. LOVETT: Thank you. That's all.

6 THE COURT: All right. Any other questions?

7 MR. MCLUSKY: No, Your Honor.

8 THE COURT: All right. Doctor, you may step down.

9 Do you have other rebuttal evidence?

10 MR. LOVETT: We have one other witness, Your Honor.  
11 Dr. King.

12 THE COURT: Any idea how long your direct will take  
13 of Dr. King?

14 MR. LOVETT: It's up to Mr. Becher.

15 MR. BECHER: I would approximate around an hour,  
16 Your Honor.

17 THE COURT: All right. We're going to go ahead and  
18 take a break now. It's almost ten after twelve. We're going  
19 to take a little bit longer recess, understanding the warning  
20 I gave you yesterday about finishing today. But with that,  
21 we're going to stand in recess until 1:30.

22 (Lunch recess from 12:08 p.m. to 1:37 p.m.)

23 AFTERNOON SESSION

24 THE COURT: All right. Are we ready to proceed?

25 MR. BECHER: We are, Your Honor.

King - Direct

1 THE COURT: Call your next rebuttal witness.

2 MR. BECHER: Plaintiffs call Dr. Ryan King.

3 THE COURT: Dr. King, you've already been sworn.

4 You remain under oath, of course.

5 RYAN KING, PLAINTIFFS' WITNESS, PREVIOUSLY SWORN

6 DIRECT EXAMINATION

7 BY MR. BECHER:

8 Q. Good afternoon, Dr. King.

9 A. Good afternoon.

10 Q. You've been listening to the testimony here the last  
11 couple of days, have you not?

12 A. I have.

13 Q. Does any of that testimony change your opinion as to the  
14 relationship or causal relationship between ionic conductivity  
15 and biological impairment in Stillhouse Branch?

16 A. No.

17 Q. Unfortunately, I have a few questions to follow up on  
18 that. I'd like to first address some of the testimony that  
19 you heard from Miss Kuehn. Were you present while she was  
20 testifying?

21 A. Yes, I was.

22 Q. She walked us through a number of statistical techniques.  
23 Was there anything in her testimony that was novel or  
24 unfamiliar to you as an ecologist versus an epidemiologist or  
25 statistician?

King - Direct

1 A. No. All the techniques that she mentioned fall under  
2 basic biostatistics that, you know, I've been trained in. So,  
3 no.

4 Q. There's no super secret line of statistics in  
5 epidemiology or anything like that?

6 A. No. It was all very much conventional.

7 Q. Okay. Let's talk about some of that. I believe  
8 Miss Kuehn talked about four types of regression analysis. Do  
9 you recall that?

10 A. I do.

11 Q. Are you familiar with linear regression?

12 A. Yes.

13 Q. Can you explain that?

14 A. Well, linear regression is basically looking to find the  
15 least squares, that is, fit a line to a cloud of data where  
16 you have a predictor and a response, and it's trying to  
17 find -- minimize the sum of squares around that line,  
18 basically fit the line through the data in a way so that the  
19 points are as close to it across the whole line as possible.

20 Q. What about a logistical regression?

21 A. Logistic regression is a technique that uses binary  
22 response data, so, you know, for example pass/fail, 0/1, and  
23 it's basically a technique where you have one or multiple  
24 predictors trying to explain the variance in the presence or  
25 absence or the binary response.

King - Direct

1 Q. How about Poisson or binomial negative distribution? I'm  
2 sure those are two different techniques, but --

3 A. They are. They're all related. You know, Poisson is  
4 really a distribution. And so what you're assuming is that  
5 your data has a particular distribution; and when you fit a  
6 regression line to it, you're using an error structure that  
7 matches the distribution of your data.

8 So Poisson data is frequently used for count data, but it  
9 makes also the assumption that the mean and the variance of  
10 the fitted model are roughly equal to one. And that is very  
11 rare with, like, species count data, ecological data. So more  
12 frequently -- and I've published several papers using this  
13 technique -- is negative binomial models of either generalized  
14 linear models or generalized additive models.

15 In fact, the "How Many Mountains" paper, we used a  
16 negative binominal GAM model that was multivariate, where we  
17 actually removed the effect of habitat. And we've heard a lot  
18 about how we haven't accounted for that and how we needed to  
19 add those in. And we did that explicitly to look at the  
20 effect of conductivity independent of the effect of habitat,  
21 and that the estimate that we came up with in that particular  
22 regression was based on the fact that habitat was removed.  
23 And so the 308 microsiemens as the place where on average  
24 WVSCI fails accounted for RBP habitat score in that model.

25 So to say that I haven't used these techniques or are not

King - Direct

1 familiar with them just really illustrates a lack of  
2 familiarity with the work that's gone on.

3 Q. And you mentioned or just talked briefly about the "How  
4 Many Mountains" paper. I want to follow up a little bit on  
5 that.

6 They used a multilinear or a multivariate technique to  
7 account for factors, confounding factors, or potential  
8 confounding factors?

9 A. Well, yes, in a way. It's a way of saying that we  
10 recognize that habitat affects WVSCI scores. That was not in  
11 question. Habitat had a very weak correlation; and  
12 graphically if you look at the two relationships between  
13 habitat and conductivity in that particular dataset, there was  
14 a response between the two that we consider to be important  
15 enough to add habitat to the model so that we accounted for it  
16 in that regression. But it wasn't so strong that we deemed it  
17 as, like, the two go hand-in-hand.

18 In other words, there was a highly significant component  
19 of variance that was explained by conductivity independent of  
20 habitat, which sort of gets at the idea of is conductivity  
21 being heavily confounded by habitat, and by adding habitat,  
22 did it really change the model. And it didn't.

23 Since it didn't, that's strong evidence that it's -- that  
24 conductivity alone explains impairment in WVSCI.

25 Q. Thank you. And I want to back up to the different forms

King - Direct

1 of data. Is it ever appropriate to use linear regression on  
2 count data?

3 A. Sure. Really what the issue is, is are the residuals  
4 normally distributed if you use just a strict linear  
5 regression model. And that can certainly be true. It's not  
6 necessary to say, oh, well, you must use this other model  
7 if -- and there's also cases where analyses are very much  
8 exploratory or just illustrative or is simply revealing that  
9 two variables are very weakly related. And it's a very common  
10 practice to simply fit a correlation or a linear regression to  
11 illustrate the trend line through the data without making any  
12 specific strong inferences such as we're going to use this as  
13 a predictive model to model the effect. But there's no  
14 attempt to do that in my rebuttal report. That was not the  
15 purpose.

16 Q. And Miss Kuehn talked a lot about a priori knowledge. Is  
17 it important to use a priori knowledge to be familiar with the  
18 underlying dataset before you apply a particular statistical  
19 technique?

20 A. Absolutely. I mean, as Miss Kuehn testified, a priori  
21 knowledge I believe she said strongly outweighs statistical  
22 evidence and should guide the types of analyses and the  
23 interpretation of those data.

24 So without a priori knowledge about the variables in  
25 question, a statistical analysis would be completely blind and

King - Direct

1 very hard to interpret and probably would result in some very  
2 misleading results.

3 Q. Did you hear her testify as to her understanding of how  
4 the benchmark was derived?

5 A. I did.

6 Q. Do you remember how she described that?

7 A. Yeah. I remember there was some stammering and some  
8 confusion, and then she said something along the lines of it  
9 was about deriving a benchmark for conductivity based on  
10 impairment as measured by the WVSCI.

11 Q. Is that in fact how the benchmark value of 300 was  
12 derived?

13 A. Not -- not at all. In fact, it's rather remarkable that  
14 her entire testimony was based on debunking the benchmark when  
15 in fact she didn't even understand what the outcome of  
16 interest was. It's not clear that she even read the report,  
17 because to have read it, you would know that it was based on  
18 developing a species sensitivity distribution based on  
19 individual taxa responses to conductivity and finding the  
20 level at which 5 percent of the genera were extirpated, which  
21 is a standard ecotoxicological method for establishing water  
22 quality criteria.

23 Q. And would that misunderstanding of the underlying data,  
24 would that call into question the criticism of the statistical  
25 techniques or testimony about which statistical techniques



King - Direct

1 should have been applied?

2 A. I would again call everything into question that she  
3 said.

4 Q. Okay. I just want to bring up an example. She mentioned  
5 logistical regression a number of times. Can you remind me  
6 what use logistical regression has on what type of data?

7 A. Again, it's for binary response data.

8 Q. And are these statistical or species -- strike that. Are  
9 these species sensitivity distributions over many genera? Is  
10 that binary data?

11 A. No, it's not. In fact, they were looking at probability  
12 of occurrence based on frequencies in different -- in  
13 different bins of conductivity, and those bins were weighted  
14 by the number of observations. So, no, they use a generalized  
15 additive model to identify the level at which the taxa were --  
16 95 percent of the occurrences were found.

17 Q. While we're on that, do you recall from Dr. Menzie's  
18 report and Dr. Menzie's testimony how he used species  
19 sensitivity data as well to -- temperature, rather, than  
20 conductivity?

21 A. Yes, I do.

22 Q. Can you explain what the difference between the methods  
23 he used and the methods in the benchmark are?

24 A. Well, the most important flaw in what he did was he did  
25 not consider the fact that there are many more temperature

King - Direct

1 observations in the lower third to middle of that distribution  
2 such that there's not very many higher temperatures. And  
3 because of that, the analysis that he did was biased so that  
4 the numbers would come out low.

5 In other words, if you don't have very many samples at  
6 higher levels of temperature, the likelihood that you would  
7 detect a taxa there is much smaller than if you have a large  
8 number of samples at intermediate or cooler temperatures. And  
9 so these cool water organisms, whether or not they are  
10 affected in the way he described, the analysis itself was  
11 biasing everything low.

12 Q. So let's turn to some of those species sensitivity  
13 distributions in Dr. Menzie's report. Can you turn to tab 70  
14 for me in the joint exhibit notebook, the second joint exhibit  
15 notebook.

16 A. Okay.

17 Q. Can you explain to the Court with those charts how not  
18 taking into account the number of samples would affect the  
19 data?

20 A. Well, the lines that he has drawn here represent where --  
21 you know, the cumulative proportion is actually drawn in a way  
22 that's sort of the opposite of how I would have drawn it,  
23 basically, saying a hundred percent of them are at the lowest  
24 level of temperature, which is, really, you're starting from  
25 zero and you're moving it up. It should have been drawn the

King - Direct

1 other way.

2 But besides that, there are much larger numbers of  
3 samples particularly between 15 and 20. That's sort of the  
4 main area where there were a lot of data.

5 MR. HARVEY: Your Honor, there's no discussion of  
6 this in Dr. King's expert reports.

7 THE COURT: Well --

8 THE WITNESS: I had the discussion -- I'm sorry.

9 THE COURT: What did you identify in the rebuttal  
10 report?

11 MR. BECHER: In the rebuttal report, he was -- well,  
12 give me one minute, Your Honor.

13 THE COURT: All right.

14 MR. BECHER: I'll move on, Your Honor.

15 THE COURT: All right.

16 BY MR. BECHER:

17 Q. Let me back up. So the benchmark was derived with  
18 species sensitivity distribution data, not based on pass/  
19 failing the WVSCI score. Is that a correct understanding?

20 A. That is totally correct.

21 Q. But EPA did do a supplemental or ancillary analysis to  
22 look at the effect of the benchmark value on WVSCI; is that  
23 right?

24 A. They did. They recognized that West Virginia had an  
25 index that was used to assign impairment to sites, and so they

King - Direct

1 did an ancillary analysis of -- which actually was a log-  
2 linear regression, that this is -- this is one area where I  
3 think there was some discussion and confusion about, which was  
4 it a logistic regression or what. The graph that's shown --

5 Q. Well, let's turn to that graph. It's page JE 464.

6 A. Okay.

7 Q. As you said, there was some confusion or difference of  
8 opinion on what type of -- what type of data this represented  
9 or what kind of statistical technique this represented. Can  
10 you explain this graph?

11 A. Yes. So each one of the points represents the bins that  
12 they used, the weighted bins. And so these were bins that  
13 were basically derived by putting sample units into classes of  
14 conductivity using a log scale. And within each of those  
15 classes, then they take the mean of the WVSCI score. And you  
16 can see that there's a mean -- a dot that represents the mean  
17 WVSCI of that particular conductivity bin.

18 The whiskers represent, as they say in the figure  
19 caption, 95 -- excuse me -- 90 percent confidence intervals  
20 about the mean. And then they performed a -- it is a form of  
21 linear regression, but they used the data, if you notice, are  
22 on a log scale. If you look at the X axis, it goes from 100  
23 to 1000 to 10,000 because the -- all the low numbers would be  
24 very hard to see on a normal scale graph without log scaling,  
25 would look like a really sharp, like, non-linear sort of

King - Direct

1 distribution. But by log transforming it, it's very, very  
2 linear.

3 And the fitted line is a least squares regression line,  
4 and there are dotted lines around that line that represent the  
5 95 percent confidence intervals about the fit to the line.

6 And from there, they assessed at what level -- for  
7 example, 68 is where the dotted line corresponds, and where  
8 does this regression line intersect the impairment threshold  
9 of 68. And that corresponded to a value of, in this case, 180  
10 microsiemens, which is lower than some of what we've been  
11 hearing.

12 They estimated that the WVSCI value would be 64 at 300  
13 microsiemens. So the extirpation concentration from the  
14 benchmark derived from the species sensitivity distribution of  
15 300 essentially shows that that would correspond to a failing  
16 WVSCI score. So the -- if anything, the benchmark document's  
17 recommendation of 300 is somewhat conservative because  
18 there's -- we've gone four points below the impairment  
19 threshold for WVSCI based on this relationship.

20 Now, this is just one piece of data, and there's been  
21 several other examples where we've analyzed WVSCI and come up  
22 with slightly different numbers. But the long story short,  
23 we're consistently coming out at around 300 with lots of  
24 different techniques and subsets of data.

25 Q. So you don't have any problem with the approach that EPA

King - Direct

1 took in the benchmark to drive these numbers in this  
2 supplemental analysis.

3 A. No. And they're simply just reporting what they found,  
4 and they don't go much beyond that.

5 Q. It's somewhat similar to a graph that you did in your  
6 report; is that right?

7 A. Yes. It's similar to what we did in the "How Many  
8 Mountains" paper as well, but the graph I did in the report  
9 was, again, more just an illustration, an exploratory approach  
10 to show that the relationship or lack thereof between  
11 temperature and conductivity and temperature and the number of  
12 mayflies, which is the most sensitive group, contributes most  
13 to the WVSCI scores.

14 Q. If I could, please, turn to page -- or Joint Exhibit 31.

15 Let's start with the next one, Joint Exhibit 32. I  
16 apologize.

17 Now, this is a graph from your rebuttal report, correct?

18 A. It is.

19 Q. First of all, I believe you received a lot of criticism  
20 for this graph in Dr. Kuehn's testimony; is that right?

21 A. Well, yeah, I mean I guess it was criticism.

22 Q. I just want to clarify. You didn't form -- inform your  
23 whole opinion of causality or confounding on this graph, did  
24 you?

25 A. No. Again, it was taken in the context of all sorts of

King - Direct

1 other sources of information that had been cited before,  
2 including some of the work that they did in the benchmark.  
3 Again, weight of evidence is what's going on here.

4 Q. So, for example, the papers that you referred to in your  
5 report and we spent some time going over with the Court the  
6 other day?

7 A. Yes, exactly. Yes.

8 Q. And you don't put heavy weight on that R-squared value,  
9 do you?

10 MR. HARVEY: Your Honor, he's just trying to  
11 rehabilitate the witness from cross. This isn't rebuttal.

12 THE COURT: I don't recall this particular --  
13 well --

14 MR. BECHER: This was specifically mentioned by  
15 Dr. -- or Miss Kuehn, and she specifically criticized his use  
16 of the R-squared value. I'm just trying to explain Dr. King's  
17 use of the R-squared value.

18 THE COURT: All right. Go ahead. Overruled.

19 THE WITNESS: Yeah. The R-square value is  
20 associated with -- again, this is a least squares regression  
21 line, and it's there to illustrate that the trend in the data  
22 is very weak, almost flat; but, more importantly, the box that  
23 I used to highlight the range of values -- okay? -- so  
24 visualizing the data. This is something that Dr. Kuehn --  
25 Miss Kuehn and I agree on tremendously, is the importance of

King - Direct

1 visualizing your data, okay? And graphically. I mean we  
2 don't need this regression line and the R-square to see that  
3 as you move along this temperature gradient from low to high,  
4 you get consistently similar levels of mayflies across the  
5 whole gradient, meaning there's not a strong response of the  
6 number of mayfly taxa to temperature in this particular  
7 dataset.

8 BY MR. BECHER:

9 Q. And you did this graph in your rebuttal report  
10 specifically to address a temperature analysis that Dr. Menzie  
11 presented in his report; is that right?

12 A. Yes, because he had focused on sensitive taxa, many of  
13 which were mayflies; and I was then showing that, in fact,  
14 numbers of mayflies that are sensitive are found all the way  
15 up to 28 degrees C, and in some cases as many as 10 mayfly  
16 taxa. And we see this in the database.

17 Q. I'd actually like to display this, if I could. I've  
18 taken the liberty of correcting the labels on the axes here,  
19 but do you recall Dr. Menzie's key temperatures of transition?

20 A. Yeah, of 19 to 21.

21 Q. Okay. So let's just go with the upper value there. And  
22 would you agree that's about the 21 degree value? Let's  
23 just --

24 A. Yes, it looks -- yeah, I mean it's -- yes, it's certainly  
25 very close.



King - Direct

1 Q. Okay. And we see plenty of mayflies in those data?

2 A. Yes. There's a range. There's, in fact -- in fact, once  
3 you get above -- ironically, when you get above 24, there's  
4 not a single case where there's a site without a mayfly. We  
5 see missing -- the most cases where we have no mayflies occur  
6 between 17 and 22 --

7 THE COURT: Let me ask you a question about this.  
8 At the top of this part of the chart, it says, "5 to 10 mayfly  
9 taxa occur at sites spanning the entire range of stream  
10 temperatures."

11 What does the 5 to 10 mayfly taxa refer to, and is that  
12 somehow shown as part of the chart?

13 THE WITNESS: Well, it's just showing on the -- so  
14 on the Y axis where this box is, I've actually drawn it from  
15 about 4 up to 10. So I could have said from 4 to 10, but the  
16 point being is regardless of where you are on this temperature  
17 gradient, there are sites that have numerous mayfly taxa, you  
18 know, between 5 and 10 that --

19 THE COURT: All right. So that's what I was getting  
20 at. So then at each of the -- I guess they're little diamond-  
21 shaped --

22 THE WITNESS: Yes.

23 THE COURT: That represents at least 5 up to 10  
24 mayflies being --

25 THE WITNESS: It represents the number of mayflies,

King - Direct

1 which is on this axis here, which is mislabeled. We actually  
2 had corrected this, and I think we accidentally got the  
3 wrong -- the uncorrected draft submitted.

4 THE COURT: All right. So just, again, to make sure  
5 I understand, let's look at temperature at 26 degrees.

6 THE WITNESS: Yes.

7 THE COURT: Going vertically --

8 THE WITNESS: Uh-huh.

9 THE COURT: -- it looks as though there was a  
10 site -- does this indicate there was a site that had one  
11 mayfly?

12 THE WITNESS: Yeah. There's one at one.

13 THE COURT: And the next site up would be a site  
14 that had two mayflies?

15 THE WITNESS: That's right.

16 THE COURT: And then at uppermost at 26 degrees,  
17 there was a site that had 10.

18 THE WITNESS: Yeah. And that one is probably more  
19 closer to 27 --

20 THE COURT: Right.

21 THE WITNESS: -- but yes. So there's -- and there's  
22 a couple above that 26 that have four and five mayflies.

23 THE COURT: Right.

24 THE WITNESS: Another right around there that has  
25 seven. So the point being is if you look across that upper

King - Direct

1 part of the graph, you've basically seen similar numbers. I  
2 mean it's variable, but the point is that they're not only --  
3 it's not only presence. Recall in the benchmark document,  
4 they did a contingency table about presence and absence of  
5 mayflies.

6 Well, here we're actually counting how many. So it's not  
7 like, well, there's just one all the time up there. It's  
8 really that there's usually several. And for that to be true,  
9 I mean there are only a couple of mayfly taxa, a very small  
10 number, that were deemed to be tolerant of conductivity.

11 So most mayflies are really sensitive to conductivity,  
12 yet we find them here at these temperatures. These are not  
13 lethal temperatures.

14 One thing to keep in mind is despite Dr. Menzie's  
15 presentation, which, by the way, he stratified his data by  
16 looking at reference site data from up to 2008 and then  
17 Stillhouse data from 2009 to 2013, which happened to have two  
18 of the warmest years on record, so that comparison has some  
19 major flaws.

20 Those reference sites, had they been in that dataset and  
21 exposed to that high temperature, we would've seen 2 to 3  
22 degrees warmer in those sites.

23 So that's something that really needs to be taken into  
24 account here as well. So the punchline is, depending on how  
25 you filtered the data, and it's really important that you

King - Direct

1 account for the fact that there's warm years, cool years, and  
2 these organisms have evolved and adapted to a wide range of  
3 temperatures. I think we'll have another exhibit in a minute  
4 where you'll see fully forested sites that have 30 degrees  
5 Centigrade.

6 BY MR. BECHER:

7 Q. I just want to ask a clarifying question. When we see  
8 what we've been referring to the last couple of minutes as  
9 number of mayflies, is that the number of individual mayflies?

10 A. No. It's the number of mayfly taxa, so different  
11 species.

12 Q. Species or genera or family, depending on how good the  
13 data is?

14 A. Yes.

15 Q. If you'd flip back a page, we have one of the most  
16 important things about that graph, was its relation to the  
17 previous one where we looked at the number of mayfly taxa  
18 versus conductivity. And here at a level like we have in  
19 Stillhouse -- actually, Stillhouse is nearly off the graph; is  
20 that correct?

21 A. Yes. Stillhouse is higher than any of the points. And  
22 so once we get to 2500, there's no mayflies. And above 1500,  
23 there's -- let's see -- six, seven records of no mayflies and  
24 two records of mayflies. And in those cases, there was one  
25 and two taxa.

King - Direct

1 Q. Miss Kuehn read from a number of epidemiological or  
2 statistical references and textbooks. Do you recall hearing  
3 that testimony?

4 A. Yes, I did hear.

5 Q. Do you recall anything that was stated in those textbooks  
6 that directly contradicted your analysis or the analysis of  
7 the benchmark?

8 A. No.

9 Q. What was the problem, then? Why did Miss Kuehn have such  
10 a problem based on those statistical textbooks, but you don't?

11 A. Well, I think she didn't understand what the outcome of  
12 interest, which is her terminology, or the response variable,  
13 which is a statistical way of referring to it -- she didn't  
14 even understand what that was. So how we would be doing  
15 multiple regressions on species sensitivity distributions is  
16 really, you know, an odd suggestion, you know.

17 So I mean some of her suggestions were -- just simply  
18 didn't match the type of response that they were examining.

19 Q. This is important why -- or illustrates why it's very  
20 helpful to have a priori knowledge, knowledge in the field  
21 when you're applying statistical methods.

22 A. Exactly. Well, and further the criticisms about the way  
23 that EPA, quote/unquote, dismissed certain variables, such as  
24 temperature, was also based largely on their understanding of  
25 their scientists who have decades of experience working in

King - Direct

1 streams, and they understand the magnitude, the likely  
2 magnitude of effect that a certain variable is going to have  
3 on the outcome of interest relative to other ones because they  
4 understand the biology, the organisms, and so forth.

5 So this is -- you know, again, she said it herself.  
6 A priori knowledge far exceeds, you know, statistics in, you  
7 know, in going through this causal analysis, confounding  
8 factor analysis, because without it, you just simply don't  
9 know where to begin.

10 Q. You don't deny that the benchmark used principles of  
11 epidemiology in their causal assessment or analysis of  
12 confounding, do you?

13 A. No. They certainly -- they did, but I think to --

14 Q. But those weren't -- those weren't taken directly from  
15 epidemiology and placed in the context of ecology, were they?

16 A. No, not at all. I mean they're very open and upfront  
17 about that. I mean that's a major distortion of what they  
18 did.

19 Q. Can you turn to Plaintiffs' Exhibit 4, please. I'm  
20 looking at the Cormier and Suter paper, "A Method for  
21 Assessing Causation of Field Exposure-Response Relationships."

22 THE REPORTER: I'm sorry. Say that again.

23 Q. "A Method for Assessing Causation of Field  
24 Exposure-Response Relationships."

25 A. (Nods head up and down)

King - Direct

1 Q. Okay. And this was one of the papers that Cormier and  
2 Suter put forth after they had published the benchmark, and it  
3 was published in peer-reviewed literature; is that correct?

4 A. Yes.

5 Q. Can you turn to page P81. What is that table?

6 A. Well, this is the way they went about translating Hill's  
7 considerations from the seminal epidemiological paper that he  
8 wrote in 1965 for this particular application, and this is  
9 actually something they developed 15 years ago as part of the  
10 CADDIS or causal analysis decision framework.

11 Q. So they were taking principles of epidemiology and  
12 modifying them to be appropriate for use in ecological data?

13 A. Correct.

14 Q. And, in fact, these characteristics based on the Hill  
15 characteristics, if you recall we had a rather lengthy reading  
16 of another Cormier and Suter paper on Wednesday. Were these  
17 the very characteristics that you were reading the analysis  
18 of?

19 A. I believe so.

20 Q. Okay. I want to turn back to the joint exhibit notebook  
21 and turn to page JE 492.

22 A. Okay.

23 Q. And this is a contingency table; is that correct?

24 A. Yes, that's correct.

25 Q. And there were some warnings about the use of contingency

King - Direct

1 tables in a causal analysis or an analysis of confounding  
2 factors. Do you recall that?

3 A. I do. I remember, you know, in particular that, like,  
4 well, we don't know how many sites have good habitat on this  
5 side, or, you know, what about temperature? But they also did  
6 all -- contingency tables for all of those other variables as  
7 well. So in isolation, that's a point. But given the fact  
8 that they did it across 12 different confounding variables  
9 kind of, you know, clearly rebuts that point.

10 Q. So, for example, if we go back to page JE 486, there's  
11 another example of a contingency table analyzing a different  
12 potential confounding factor.

13 A. Yes.

14 MR. HARVEY: Your Honor, again, this is  
15 rehabilitation from material we discussed on cross.

16 MR. BECHER: I believe Dr. Kuehn testified directly  
17 that there was a major problem --

18 THE COURT: She did. Same tables.

19 BY MR. BECHER:

20 Q. Turn to page JE 493. This clearly explains that the  
21 contingency table was one small piece of evidence that EPA  
22 used; is that correct?

23 A. That's correct.

24 Q. Along with other factors, including multivariate  
25 statistics.



King - Direct

1 A. That's right.

2 Q. I'm sorry to keep switching notebooks on you. Well,  
3 before I switch, can you turn to page JE 482, please.

4 As I understand it, this is an output from --

5 MR. HARVEY: Objection, Your Honor. Now, this is  
6 well out of bounds.

7 MR. BECHER: She testified to this very figure.

8 THE COURT: Page?

9 MR. BECHER: 482, JE 482.

10 MR. HARVEY: Your Honor, as you know, Miss Kuehn  
11 criticized EPA in her report for failing to use multiple  
12 regression. Dr. King did not respond to this criticism in his  
13 rebuttal report. At his deposition I asked him what  
14 statistical techniques EPA used. He did not point to this  
15 multiple regression. He pointed only to the contingency table  
16 he just talked about.

17 On direct I asked him about the SAB's concerns and how  
18 EPA addressed those. He did not point to this multiple  
19 regression. The time has passed to raise this as a concern or  
20 an issue.

21 MR. BECHER: Your Honor, I will admit that Dr. Kuehn  
22 gave a very general criticism of the benchmark in her expert  
23 report. Dr. King gave a fairly narrow response.

24 In testimony, Miss Kuehn referred directly to this figure  
25 and said she could not interpret them because it didn't have

King - Direct

1 markers of significance including p-values.

2 I'm merely asking Dr. King to interpret this exhibit that  
3 was referred to in Miss Kuehn's direct.

4 MR. HARVEY: Your Honor, she specifically said in  
5 her expert report that EPA and Dr. King failed to use multiple  
6 regression, and that was the major criticism of her expert  
7 report.

8 He never addressed that, didn't address it on direct in  
9 this case. It's too late to raise that now.

10 THE COURT: Well, unless you can show me somewhere  
11 in his report, his rebuttal report, where he identified these  
12 different types of regression models and that he was going to  
13 rely upon those, I'm going to sustain the objection.

14 MR. BECHER: I'll move on, Your Honor.

15 BY MR. BECHER:

16 Q. If I could, I'll have you open the plaintiffs' exhibit  
17 notebook to page PE 402.

18 I just want to verify that in the middle of the page,  
19 "Consider further use of quantitative statistical analyses,"  
20 is that paragraph what Dr. Kuehn testified is the criticism to  
21 the benchmark for not using multivariate --

22 A. Yes.

23 THE REPORTER: I'm sorry.

24 MR. BECHER: Yes?

25 THE REPORTER: I didn't hear your full question.

King - Direct

1 BY MR. BECHER:

2 Q. Miss Kuehn testified to about criticizing the non-use of  
3 multivariate statistics and multiple linear regression.

4 A. Yes.

5 Q. Did they, in fact, use multivariate statistics and multi-  
6 linear regression?

7 A. Yes.

8 Q. Would you turn in the same -- in the same notebook to  
9 Plaintiffs' Exhibit 19, page PE 287.

10 A. Okay.

11 Q. This is the Pond 2014 paper that has been referred to a  
12 lot in this litigation, correct?

13 A. Yes.

14 Q. I think Miss Kuehn also testified about this paper and  
15 her trouble with the statistics in this paper.

16 A. Yes.

17 Q. Do you recall her criticism?

18 A. Well, one of them was that she commended them for using,  
19 you know, principal components analysis, which is a method for  
20 essentially identifying or extracting bundles of variates that  
21 correspond to several variables at once; and then she said,  
22 "But then they proceeded to ignore some of the principal  
23 component axes," which apparently had, in her words, very  
24 large eigenvalues.

25 And while the eigenvalues in question are, you know,

King - Direct

1 subjective as far as whether they're large or not, she failed  
2 to acknowledge that there's actually a much better way of  
3 assessing whether or not a component is interpretable. And  
4 that's through randomization, basically doing a randomization  
5 test, which is reshuffling the data thousands of times and  
6 then looking at what sort of scores that you get independently  
7 of, you know, that original distribution.

8 And so they did this randomization test and determined  
9 that for chemistry, axis 1 was highly significant and axis 2  
10 was also significant, but axis 3 was not.

11 They also referred to looking at the metals axis, which  
12 is the second axis, and it did not correspond well with  
13 biological data. So they did not proceed to analyze it  
14 further.

15 In terms of habitat, only the first principal component  
16 was deemed to be statistically significant. So for all of  
17 her, I guess, preaching about statistical significance and  
18 stats, to ignore that aspect of it and then criticize them for  
19 not interpreting eigenvalues that weren't statistically  
20 significant again seems as though she didn't read the paper or  
21 just misread it or doesn't understand these statistics.

22 Q. So you think what Pond did here was very appropriate.

23 A. Yes.

24 Q. Now, I don't think I need to turn back to it, but if you  
25 recall your plots of temperature and conductivity in relation

King - Direct

1 to mayflies --

2 A. Yes.

3 Q. -- we saw temperature variates in a set of streams in the  
4 West Virginia database that varied by how much?

5 A. Well, it depends on what time of year, but in, you know,  
6 the summer months, you know, the -- you know, are we referring  
7 to the difference between Stillhouse and some other streams?

8 Q. I just want to know the range of temperatures in the  
9 database that you looked at --

10 A. Oh. Oh, yeah. In the summer, there's samples that range  
11 from 10 to 30-something degrees C. Yes, there's a huge range  
12 of temperatures.

13 Q. Okay. And how about the range of conductivity?

14 A. Well, the range of conductivity -- when I say the range  
15 of temperature, it's nothing compared to the range of  
16 conductivities. You know, background conductivities, if we  
17 use all of the reference sites, level 1, 2, and 3, go up to  
18 right around 300. But most of them are less than 200, sort of  
19 the natural conductivity.

20 Those conductivities in the database are over 10,000; so  
21 orders of magnitude differences. So in terms of temperature,  
22 we see, you know, a normal range. In fact, these ranges are  
23 within the normal range that these organisms evolved. And  
24 then in terms of conductivity, we see a range that is so far  
25 outside the bounds of what these organisms have experienced

King - Direct/Cross

1 through evolutionary time. This is something we call a novel  
2 gradient, where through -- in evolution they've never  
3 experienced this. And the outcome for certain types of  
4 organisms is often, you know, very fatal. And so it's just  
5 night and day as to how different those two variables are.

6 Q. Have you ever read any literature that would support  
7 species extirpation or species absence from particular areas  
8 at 19 or 20 degrees Celsius?

9 MR. HARVEY: Objection, Your Honor. We're about to  
10 hear testimony from reports that aren't listed in either  
11 report from Dr. King.

12 THE COURT: Sustained.

13 MR. BECHER: Nothing further, Your Honor.

14 THE COURT: All right. Cross-examination?

15 THE WITNESS: May I get some water?

16 THE COURT: Yes. Hold on. The witness would like  
17 some water.

18 MR. BECHER: May I approach?

19 THE COURT: Yes, you may.

20 THE WITNESS: Thanks. I was getting dry.

21 CROSS EXAMINATION

22 BY MR. HARVEY:

23 Q. Dr. King, the benchmark is based on a species sensitivity  
24 distribution; is that correct?

25 A. Yes.

King - Cross

1 Q. Is it a measure of stream impairment?

2 A. It is a measure that they use to derive a water quality  
3 standard. So technically it's not a measure of stream  
4 impairment because it's not in the water quality standards of  
5 the State of West Virginia.

6 Q. So it cannot be relied upon to show impairment in this  
7 case, correct?

8 A. No, that's not what I'm saying. I'm saying we use the  
9 term "impairment" in the legal sense. The legal sense with  
10 the West Virginia Stream Condition Index is what's used to  
11 deem a site impaired. EPA provided this benchmark as a  
12 guidance to -- so that states like West Virginia might go  
13 ahead and use it to have them.

14 Q. To prevail in this case, the plaintiffs must show that  
15 Fola had discharged something that caused a violation of the  
16 WVSCI score, correct?

17 MR. BECHER: Your Honor, I object. This calls for a  
18 legal conclusion.

19 MR. HARVEY: I'll move on, Your Honor.

20 THE COURT: All right.

21 BY MR. HARVEY:

22 Q. Mr. Tyree, can you put up Joint Exhibit 32 on the screen?

23 Do you have that still, Dr. King, Joint Exhibit 32?

24 That's your mayfly graph.

25 Do you have it now, Dr. King?

King - Cross

1 A. I have it here.

2 Q. Does this graph include a p-value?

3 A. It doesn't include a p-value, no. This was not a -- this  
4 was not a graph that was for predictive purposes. It was for  
5 data screening, data visualization.

6 Q. Do any of your graphs in your rebuttal report include  
7 p-values?

8 A. No, they don't.

9 Q. Did you hear Dr. Palmer criticize certain of Dr. Menzie's  
10 graphs for failure to include tests of statistical  
11 significance?

12 A. I did, and I also heard Dr. Kuehn --

13 Q. Did you hear that, Dr. King?

14 A. Yeah. It was very similar to what Dr. Kuehn was saying.

15 THE COURT: Just answer his question.

16 THE WITNESS: Yeah.

17 BY MR. HARVEY:

18 Q. The judge has threatened us that if we do not leave here  
19 by 5:00, and I'm not going to call his bluff. So if you can  
20 answer my questions, we'll steer well clear of that.

21 A. Okay.

22 Q. Mr. Tyree, can you put up Joint Exhibit 33?

23 This is a graph from your rebuttal report. Do you recall  
24 that, Dr. King?

25 A. I do.



King - Cross

1 Q. And you produced in this graph certain conductivity  
2 thresholds for different bugs, correct?

3 A. Yeah. These were ones that were found in Fall 2013 in  
4 Chris Swan's collection.

5 MR. BECHER: Your Honor, we never discussed this  
6 graph during direct rebuttal.

7 THE COURT: Well, where are you headed?

8 MR. HARVEY: I have one question, Your Honor.

9 BY MR. HARVEY:

10 Q. Do your expert reports, either your initial report or  
11 rebuttal report, include anything in the way of an analysis  
12 like this for temperature thresholds?

13 A. Well, temperature thresholds that aren't -- were not  
14 published in this way. So, no.

15 Q. Can we move, Mr. Tyree, to Joint Exhibit 58, page 464,  
16 the logistic regression.

17 Do any of your reports run a logistic regression between  
18 WVSCI and temperature?

19 A. No.

20 Q. WVSCI and habitat?

21 A. No.

22 Q. Does EPA do that?

23 A. Do they use a logistic regression with that? No, but  
24 they use several steps to --

25 Q. Do they rule out logistic regression for that?

King - Cross

1 A. For habitat? No.

2 Q. Or temperature.

3 A. No.

4 Q. Do they graph the data in the way that we see here on  
5 this page for temperature and WVSCI?

6 A. I don't believe they do, no.

7 Q. Habitat?

8 A. No. They looked at -- they looked at predictors  
9 graphically.

10 Q. Did they graph it in this fashion?

11 A. They probably graphed it in that fashion, but they did  
12 not publish it in their document, no.

13 Q. How do you know that?

14 A. Because they would have looked at -- they would have  
15 screened it.

16 Q. Wonder why they didn't share it with us.

17 A. Well, probably because the document was already enormous  
18 and had a lot of figures in it.

19 Q. One more page wouldn't hurt, would it?

20 A. It would have been dozens of pages of figures. I'm just  
21 presuming, because I know Lester Yuan and I know how careful  
22 he is.

23 Q. Okay. Leave the same graph up if you would, Mr. Tyree.

24 Did I turn it off or did you turn it off?

25 This graph we see is not a multiple regression, is it?

King - Cross

1 A. I don't believe that it is, no.

2 Q. And it doesn't do anything to account for confounding  
3 factors, does it?

4 A. No, it does not.

5 Q. It's just a plot of data, right?

6 A. It does in the sense that it's -- there were numerous  
7 variables that were used to screen it to remove confounding  
8 factors from the dataset.

9 Q. From the old dataset.

10 A. Yes. So I mean that is one widely accepted way,  
11 regardless of what Miss Kuehn says, is a widely accepted way  
12 of doing that.

13 Q. But when you and Mr. Becher were talking about -- or  
14 Miss Kuehn was talking about multiple regression accounting  
15 for different types of confounding variables, this doesn't do  
16 that, correct?

17 A. No, but the analysis that I did in the "How Many  
18 Mountains" paper did where we -- that we accounted for  
19 habitat.

20 Q. Does the paper "How Many Mountains" include the word  
21 "temperature" anywhere within it?

22 A. I would have to go back and screen it to see if  
23 temperature was mentioned. But temperature was not mentioned  
24 in the sense of it being a variable that was used in the  
25 analysis.

King - Cross

1 Q. Okay. I screened and didn't find the word "temperature"  
2 in it.

3 A. Okay.

4 Q. Do you accept that?

5 A. Sure. I believe you.

6 Q. Can you eliminate confounding factors based on a priori  
7 knowledge or just identify them?

8 A. I think a priori knowledge is part of the process of  
9 dealing with confounding factors. So -- and I don't think  
10 a priori knowledge was used by EPA in a way that eliminated  
11 variables without further analyses, but I think their a priori  
12 knowledge informed the way that they went about assessing  
13 confounding factors in a way that led to strong inferences  
14 about how they might affect the species sensitivity  
15 distribution.

16 Q. Doctor, back to my question, can you eliminate a  
17 confounding factor based on a priori knowledge?

18 A. I would say yes, but it would depend upon what the  
19 confounding factor was. Like if someone --

20 Q. What about temperature?

21 A. I would say no. A priori knowledge would not alone be  
22 enough.

23 Q. All right. Thank you. You wrote a paper entitled "How  
24 novel is too novel? Stream community thresholds at  
25 exceptionally low levels of catchment urbanization." Do you

King - Cross

1 recall that?

2 A. Yes, I do.

3 Q. I'd like to have you read just the highlighted portions  
4 of this paper, if you would.

5 MR. BECHER: Your Honor, I object, at least until we  
6 know where this is going. He never discussed that paper in  
7 either his direct or rebuttal.

8 MR. HARVEY: This goes to --

9 THE COURT: Go ahead.

10 MR. HARVEY: This goes to the whole issue of  
11 temperature and habitat that we've just been discussing here  
12 over the last hour, Your Honor.

13 THE COURT: All right. Go ahead.

14 THE WITNESS: "Although we were surprised by the  
15 threshold level of urbanization, we submit that synchronous  
16 declines of stream taxa make sense from an evolutionary  
17 perspective and are supported by ecological theory.

18 "High biodiversity in streams is largely a result of  
19 subtle, yet critical, differences in stream flow velocities  
20 and material transport through time and space.

21 "Consequently, lotic species have coevolved to possess  
22 unique morphological, behavioral, and physiological  
23 adaptations that correspond to an often narrow range of  
24 environmental conditions. Small functional niches undoubtedly  
25 render many species intolerant of conditions that fall outside

King - Cross/Redirect

1 those experienced in evolutionary time. Thus, taxa sensitive  
2 to the novel environment are selected against, sharply decline  
3 and eventually disappear."

4 BY MR. HARVEY:

5 Q. What journal was that published in, Dr. King?

6 A. *Ecological Applications*.

7 Q. Is that a good journal?

8 A. I think so.

9 MR. HARVEY: Thank you, Dr. King.

10 THE COURT: Any redirect?

11 MR. BECHER: Briefly, Your Honor.

12 REDIRECT EXAMINATION

13 BY MR. BECHER:

14 Q. Dr. King, if I remember correctly, when we were going  
15 over your qualifications in direct, you had mentioned that  
16 you're working with EPA or an EPA grant to establish numeric  
17 criteria; is that right?

18 A. That's correct.

19 Q. Is the use of 95 percent, protecting 95 percent of the  
20 genera, extirpation of 95 percent of the genera, is that  
21 consistent with how EPA typically derives numeric criteria?

22 A. Yes, particularly with laboratory data.

23 Q. Okay. And so laboratory data, field data, this is how  
24 they do that?

25 A. Yeah. This is kind of the gold standard for EPA when it

King - Redirect

1 comes particularly to toxic substances.

2 Q. And EPA was therefore very much in line with the typical  
3 practice when deriving the benchmark this way?

4 A. Absolutely.

5 Q. There's some criticism of your graphs for not having  
6 p-values. Did Dr. Menzie's graphs have p-values?

7 A. No.

8 Q. All right. Is that a problem, not having -- is not  
9 having a p-value a problem with your graphs?

10 A. I don't think so. I mean in my graphs, I was actually  
11 plotting the data in a way that was where you could see all of  
12 the data points. They weren't being summarized into bins.  
13 They weren't being masked by, you know, boxes. It was  
14 actually just plain X, Y data. Take a look at me. What do  
15 you see?

16 Q. Let's turn back to the table in question, page JE 113,  
17 which is your plot of mayfly taxa versus temperature.

18 THE COURT: What tab is that?

19 MR. BECHER: Sorry, Your Honor. It's tab 32.

20 BY MR. BECHER:

21 Q. Was one of your main points to show that this was not  
22 significant?

23 A. It was to show that it was just a very weak relationship  
24 and, more importantly, that there were surprisingly large  
25 numbers of mayfly taxa that were occurring across the entire

King - Redirect

1 gradient.

2 Q. So you don't think a p-value is necessary to make the  
3 point you were trying to make with this graph?

4 A. I don't. I didn't put a p-value on the graph that showed  
5 mayflies versus conductivity either, which most people would  
6 realize that it's very obviously a strong relationship as  
7 compared to this one. But, again, statistical significance  
8 was not really the point. It was simply to contrast the two  
9 responses with the exact same data.

10 Q. If Dr. Menzie was making a strong inference about  
11 temperature preference --

12 MR. HARVEY: Your Honor, we're well outside my cross  
13 of Dr. King. We're now into an attack on Dr. Menzie.

14 THE COURT: Well, I don't know what he's going to  
15 ask, so --

16 BY MR. BECHER:

17 Q. Would p-values be appropriate in that instance for the  
18 relationships that Dr. Menzie --

19 THE COURT: I don't recall that he was cross-  
20 examined about that. Beyond the scope.

21 BY MR. BECHER:

22 Q. There were some questions about why EPA did not show a  
23 logistical regression related to temperature and WVSCI scores  
24 they did with conductivity and WVSCI score. Do you recall  
25 that on cross?



King - Redirect

1 A. Yes.

2 MR. HARVEY: Actually, Your Honor, I did not ask why  
3 they didn't do it. I just asked if they did it.

4 THE COURT: I think that opens up the section.

5 BY MR. BECHER:

6 Q. Do you think that EPA should have done a logistical  
7 regression to show the relationship between temperature and  
8 conductivity? Or, excuse me. Temperature and WVSCI.

9 A. That's tough to answer. I think additional analyses  
10 would have been potentially useful, but they had gone through  
11 many steps already to demonstrate that there really wasn't a  
12 strong relationship there.

13 Q. And, again, this regression, while it's very informative,  
14 this was not at the heart of how the benchmark was derived,  
15 was it?

16 A. No.

17 Q. Okay. Mr. Harvey brought up your paper "How novel is too  
18 novel" just a moment ago.

19 A. Yeah.

20 Q. And mentioned -- and had you read a section talking about  
21 evolution and novel conditions.

22 The exposure to conductivity in a stream like Stillhouse  
23 at 3000 microsiemens per centimeter, is that a novel condition  
24 or one that would have been expected in normal evolution?

25 A. I would suggest that in evolutionary time with respect to

King - Redirect/Recross

1 these organisms, none evolved or have been adapted or exposed  
2 to that mixture of ions anywhere near those concentrations.  
3 It just simply wouldn't be -- wouldn't be possible.

4 Q. What about a temperature of 24 degrees?

5 A. Absolutely.

6 Q. Absolutely what?

7 A. Yes, absolutely. I would -- in warm years, these streams  
8 I'm certain, even reference ones, I'm sure are reaching 24  
9 degrees.

10 MR. BECHER: Nothing further.

11 THE COURT: All right. Recross?

12 RECROSS EXAMINATION

13 BY MR. HARVEY:

14 Q. Throughout evolutionary times would these mayflies be  
15 exposed to sediment ponds?

16 A. Well, I don't think they are actually exposed to sediment  
17 ponds. They live in the stream.

18 Q. Would they be exposed to a stream system such as the one  
19 at Stillhouse with ponds and concrete flumes and culverts  
20 below?

21 A. Well, the environment that the organisms are living in in  
22 the stream, other than the ionic matrix, is within the realm  
23 of habitat that they probably experience in evolutionary time,  
24 yeah. Yes, I would say it is.

25 Q. How long have mayflies been around, Dr. King?

King - Recross

1 A. Oh, they've been around for millions of years.

2 Q. Since the time of dinosaurs, right?

3 A. Sure.

4 Q. And streams back then didn't have sediment ponds and  
5 concrete flumes and concrete ditches and so forth, did they?

6 A. No, but, again, the habitat where we collected the sample  
7 with the WVSCI score, I'm sure we could go back millions of  
8 years and find streams and habitat that was comparable and  
9 water temperatures that were comparable.

10 Q. Well, that's true of your study in Maryland, right? You  
11 can take one little part of the stream, and it was the same as  
12 they experienced over millions of years, but you were looking  
13 at the urbanization around that stream, correct?

14 A. No, actually it wasn't the same, because in that case  
15 there was -- there's extraordinary flashy runoff from the  
16 impervious cover, and there's chemicals that are coming  
17 through; in this case, the road salts, chlorides that tend to  
18 be very high, also chemical leaches associated with roads. So  
19 there's an entirely different suite of stressors associated  
20 with urban streams.

21 Q. Dr. King, is the concrete flume pervious?

22 A. I don't think it's pervious.

23 Q. You know better.

24 A. No, it's not.

25 Q. And this stream is nothing like what mayflies have

King - Recross

1 experienced over evolutionary time, is it?

2 A. Again, I think that it is probably within the realm of  
3 the conditions they've experienced over evolutionary time,  
4 yes.

5 MR. HARVEY: No further questions, Your Honor.

6 THE COURT: All right. Anything else?

7 MR. LOVETT: Exhibits, Your Honor. But other than  
8 that --

9 THE COURT: All right.

10 MR. LOVETT: -- we're finished with evidence.

11 THE COURT: All right. Save the exhibits, that  
12 completes the rebuttal evidence?

13 MR. BECHER: Yes, Your Honor.

14 THE COURT: All right. Does the defense want to  
15 offer any further evidence?

16 MR. HARVEY: No, Your Honor.

17 THE COURT: All right.

18 MR. MCLUSKY: We have some books we'd like to read  
19 into the record.

20 MR. BECHER: As do we.

21 THE COURT: So, first -- well, what's plaintiffs'  
22 position with regard to the exhibits that have not yet been  
23 admitted?

24 MR. BECHER: I believe we've tried to move the  
25 plaintiffs' exhibit as we go along. I don't think I had

1 Dr. King read anything from plaintiffs' --

2 THE COURT: You need to speak up.

3 MR. BECHER: Oh, my microphone is off. I apologize.

4 THE COURT: Do you want to take -- do you need five  
5 minutes to figure out what you want to say and do about  
6 exhibits?

7 MR. BECHER: Yeah. We're going to have to take some  
8 time to figure out joint exhibits. We'll figure them all out  
9 and come back in 15 minutes.

10 MR. HARVEY: Five.

11 THE COURT: Let me ask also that you consider this.  
12 There have been, well, a number of exhibits that the plaintiff  
13 has referred to. Do you intend to identify those and move  
14 those?

15 MR. LOVETT: I do not believe so, Your Honor. I  
16 would like to come up and look and see what they are.

17 THE COURT: All right. Well, we'll just recess for  
18 about ten minutes and see where you are.

19 (Recess from 2:45 p.m. to 2:58 p.m.)

20 THE COURT: All right. I understand you've each had  
21 a chance to review the posture of the exhibits.

22 MR. BECHER: Yes, Your Honor.

23 THE COURT: All right. What's the result?

24 MR. BECHER: We would like to additionally move  
25 Plaintiffs' Exhibit 4 to the extent it was read in the record.

1 THE COURT: To the extent what? Read in the record?

2 MR. BECHER: It's one of the learned treatises. So  
3 to the extent it was read in, to admit it.

4 THE COURT: If it's limited to that purpose, the  
5 defense has no objection; is that right?

6 MR. HARVEY: Same understanding as before, Your  
7 Honor, yes.

8 THE COURT: All right.

9 MR. BECHER: And then we've conferred and agreed  
10 we've already moved Joint Exhibits 4 through 16. My  
11 understanding is Miss Justice has that noted.

12 We would now move --

13 THE COURT: We have 3 through 16 she says.

14 MR. BECHER: Yes. Sorry. Yes, 3 through 16.

15 THE COURT: All right.

16 MR. BECHER: We would now move Joint Exhibits 17  
17 through 25.

18 THE COURT: Any objection?

19 MR. TYREE: No objection.

20 THE COURT: They're admitted.

21 MR. BECHER: Joint Exhibit 29.

22 THE COURT: Any objection?

23 MR. TYREE: No objection.

24 THE COURT: It's admitted.

25 MR. BECHER: Joint Exhibits 31 through 34.

1 THE COURT: Any objection?

2 MR. TYREE: No objection.

3 THE COURT: They're admitted.

4 MR. BECHER: Joint Exhibit 38 and 39.

5 THE COURT: Any objection?

6 MR. TYREE: No objection.

7 THE COURT: Admitted.

8 MR. BECHER: Joint Exhibit 43.

9 MR. TYREE: No objection.

10 THE COURT: It's admitted.

11 MR. BECHER: Joint Exhibit 53.

12 THE COURT: Any objection?

13 MR. TYREE: No objection.

14 THE COURT: It's admitted.

15 MR. BECHER: Joint Exhibits 58 through 61.

16 THE COURT: 58 through 61. Any objection?

17 MR. TYREE: No objection.

18 THE COURT: They're each admitted.

19 MR. BECHER: Joint Exhibit 64.

20 MR. TYREE: No objection.

21 THE COURT: It's admitted.

22 MR. BECHER: Joint Exhibits 67 through 78.

23 MR. TYREE: No objection.

24 THE COURT: Admitted.

25 MR. BECHER: Joint Exhibit 81.

1 MR. TYREE: No objection.

2 THE COURT: They're admitted.

3 All right. You had earlier moved -- is it 27?

4 MR. BECHER: Yes, Your Honor.

5 THE COURT: Plaintiffs' 27.

6 MR. BECHER: We will retract the request to admit  
7 27.

8 THE COURT: All right. So you're no longer offering  
9 it as an exhibit.

10 MR. BECHER: Not as an exhibit, Your Honor.

11 THE COURT: All right. Does that take care of all  
12 the exhibits, then, the plaintiff seeks to admit?

13 MR. BECHER: Yes, Your Honor.

14 THE COURT: All right. How about the defendant?

15 MR. TYREE: All exhibits have been moved to be  
16 admitted and are admitted.

17 THE COURT: All right. All right. You had  
18 indicated at the beginning that both sides would like to have  
19 a chance to brief this following a transcript. My court  
20 reporter says if we don't get tied up in another trial of  
21 significance, it will take her about a month to get a  
22 transcript.

23 In the past, I've instructed the parties to give her  
24 permission to contact experts directly if she needs to get a  
25 spelling or verify something like that, a scientific term. Is



1       that all right with both sides?

2               MR. BECHER:   Fine with plaintiffs, Your Honor.

3               MR. HARVEY:   I don't know how you would do it.

4       Absolutely, Your Honor.

5               THE COURT:   Well, almost all this is written down  
6       somewhere, and we've got an exhibit that probably repeats it.  
7       But just in case, advise your experts of that fact so that she  
8       can contact them directly and immediately to resolve things as  
9       she's doing it.

10              You know, I'd like to move this along.  And in that  
11      regard, what I would expect, then, is that the plaintiffs file  
12      their opening brief 14 days after a transcript is filed.  I  
13      know that's pretty quick, but, honestly, you're all familiar  
14      with these things, all the exhibits.  You know it a lot better  
15      than I do at this point for sure.

16              So I would like plaintiffs' opening within 15 days of  
17      receipt -- 14 days of receipt of the transcript, 14 days for  
18      the response, 7 days for a reply.  Once I receive those,  
19      obviously at that point I'll have a pretty good idea of  
20      whether I think whether oral argument will be helpful.  I will  
21      probably expect oral argument and will try to schedule that on  
22      a day when I've got plenty of time and will probably have to  
23      schedule it fairly quickly after the reply briefing is filed.  
24      So that would be my plan of attack.

25              Is there anything else we need to discuss or resolve at

1       this point?

2               MR. BECHER: Nothing from plaintiffs, Your Honor.

3               MR. HARVEY: Nothing from defendants, Your Honor.

4               THE COURT: All right. Well, then, we'll conclude  
5 this bench trial, and I'll look forward to the briefing.

6               Thank you all. As usual, very able lawyers on both sides  
7 and very thorough presentations. If not brief, thorough.

8               Thank you all.

9               (Proceedings concluded at 3:03 p.m.)

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## I N D E X

<u>Defendant's Witness</u>	<u>Direct</u>	<u>Cross</u>	<u>Redirect</u>	<u>Recross</u>
CHARLES MENZIE (resumed)		691	745	750
<u>Rebuttal</u>				
KAREN PRESTEGAARD	756	764	--	--
MARGARET PALMER	768	792	793	--
RYAN KING	795	822	830	834
<u>Joint Exhibits</u>				<u>Admitted</u>
No. 17 Margaret Palmer CV				838
No. 18 Palmer expert report, Figure 1				838
No. 19 Palmer expert report, Table 1				838
No. 20 Palmer expert report, Table 2				838
No. 21 Palmer expert report, Figure 2				838
No. 22 Palmer expert report, Figure 4				838
No. 23 Palmer expert report, Figure 6				838
No. 24 Ryan King CV				838
No. 25 King expert report, Table 1				838
No. 29 King rebuttal report, Table 2				838
No. 31 King rebuttal report, Table 4				839
No. 32 King rebuttal report, Table 5				839
No. 33 King rebuttal report, Table 6				839
No. 34 Karen Prestegaard CV				839

1	No. 38 Prestegaard rebuttal report, Table 2	839
2	No. 39 Prestegaard rebuttal report, Figure 3	839
3	No. 43 Stipulation, Docket No. 52	839
4	No. 53 WVDEP 2008 Gauley TMDL report (excerpts)	839
5	No. 58 A Field-based Aquatic Life Benchmark for...	839
6	No. 59 Final WV integrated water quality monitoring...	839
7	No. 60 Justification and Background for Permitting...	839
8	No. 61 "Permitting Guidance for Surface Coal Mining"...	839
9	No. 64 WVDEP Stream Assessment protocol, Chapter II...	839
10	No. 67 Carrie Kuehn CV	839
11	No. 68 Charles Menzie CV	839
12	No. 69 Menzie expert report, Figure 1	839
13	No. 70 Menzie expert report, Figure 2	839
14	No. 71 Menzie expert report, Figure 3	839
15	No. 72 Menzie expert report, Figure 4	839
16	No. 73 Menzie expert report, Figure 5	839
17	No. 74 Menzie expert report, Figure 6	839
18	No. 75 Menzie expert report, Figure 7	839
19	No. 76 Menzie expert report, Figure 8	839
20	No. 77 Menzie expert report, Figure 9	839
21	No. 78 Menzie expert report, Table 1	839
22	No. 81 WVDEP WAB Forms	840
23		
24	<u>Plaintiffs' Exhibits</u>	
25	No. 4 Cormier, et al. "A method for assessing"...	838

1 I, Teresa M. Ruffner, certify that the foregoing is a  
2 correct transcript from the record of proceedings in the  
3 above-entitled matter.

4  
5 /s/Teresa M. Ruffner

September 15, 2014